GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: 10-16-79

Project Title: "Software Development For AN/ALR 46"

Project No: A-2470 W. Dean Spencer S

Project Director: ~~R.E. Thomas~~

Sponsor: Warner Robins ALC; Robins AFB, Ga. 31098

Agreement Period: From 9-10-79 Until 3-15-80

Type Agreement: Delivery Order No. 10 under F09603-78-G-4368

Amount: $400,000

Reports Required: Technical Manuals; Validation Records; Service Engr. Reports; Minutes of Formal Reviews; Acceptance Test Procedures; Acceptance Test Reports; Computer Program Documentation Programming Manual; Systems Engr. Mgt. Plan; Tech. Perf. Measurement Rpt; System Test Plan; CPIN Request; Technical Order.

Sponsor Contact Person (s):

Technical Matters

Tom Batterman/MMRRVC
Warner Robins ALC
Robins AFB, Ga. 31098

Contractual Matters
(thru OCA)

Office of Naval Research
Resident Representative
325 Hinman Bldg.
Georgia Inst. of Tech.
Atlanta, Ga. 30332

Defense Priority Rating: DOA-7-under DMS Reg. 1

Assigned to: Defense Systems Div. SEL (School/Laboratory)

COPIES TO:

- Project Director
- Division Chief (EES)
- School/Laboratory Director
- Dean/Director—EES
- Accounting Office
- Procurement Office
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- EES Information Office
- EES Reports & Procedures
- Project File (OCA)
- Project Code (GTRI)
- Other

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: 12/11/80

Project Title: Software Development for AN/ALR 46

Project No: A-2470

Project Director: W.D. Spencer

Sponsor: Warner Robins ALC; Robins AFB, GA. 31098

Effective Termination Date: 7/31/80 (Del. Order No. 0010, Contr. No. F09603-78-G-4368)

Clearance of Accounting Charges: 8/31/80)for final report)

Grant/Contract Closeout Actions Remaining:

Delivery Order 0010 only

- x Final Invoice and Closing Documents
- _ Final Fiscal Report
- X Final Report of Inventions
- X Govt. Property Inventory & Related Certificate
- _ Classified Material Certificate
- _ Other _____

Assigned to: SEL/DSD (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director—EES
Accounting Office
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Library, Technical Reports Section
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

CA—4 (1/79)

A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

22 October 1979

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

Attention: Mr. Rick Yeager/PMZBB

Reference: F09603-78-G-4368 Order No. 0010

Subject: Monthly Status Report No. 1

Gentlemen:

A summary of the progress on the referenced contract for the period 10 September 1979 to 30 September 1979 is contained herein.

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

A meeting was held 10 September 1979 to discuss the basic data reduction techniques. An initial description of the data reduction methods was prepared. Intelligence data was forwarded to the Engineering Experiment Station where data reduction for band 1 was started. Training of additional personnel was begun using this data reduction as a pilot effort. This effort is to be presented at the Preliminary Design Review. Refinement of the data reduction technique will be discussed at that time.

The following is a list of technical memoranda written to document work during September:

TM-2470-100-1	Miscellaneous Correspondence - 5/8/79-9/26/79
TM-2470-100-2	Discussion of Statement of Work at WR-ALC 8/24/79
TM-2470-100-3	Contract Deliverables
TM-2470-100-5	Receipt of Contract
TM-2470-100-6	Orientation Design Review - 10, 11 September 1979
TM-2470-010-1	Equipment requirements for ALR-46
TM-2470-010-2	Justification for a NOVA Computer System
TM-2470-020-1	Test Configuration for ALR-46
TM-2470-030-1	Reducing Threat Intelligence Data

Efforts Expended

The following is the total effort expended, in man-hours, during the month of September.

Personnel	Man-Hours	
	Month	Cumulative
Thomas, R. E. Project Director	41	41
Creswell, R. E. Research Engineer II	148	148
Harbuck, A. C. Research Assistant I	10	10
Lipscomb, M. A. Research Engineer I	41	41
Miller, T. M. Sr. Res. Engineer	43	43
Ryan, P. H. Research Engineer II	69	69
Spencer, W. D. Sr. Res. Engineer	52	52

Personnel	Man-Hours	
	Month	Cumulative
Stroud, L. E. Sr. Res. Engineer	41	41
Thompson, W. K. Research Engineer I	21	21
Zimmer, R. P. Principal Research Engineer	8	8

In September 1979 a total of $13,322.62 was spent. This is also the cumulative total. The project ceiling price is $400,000 leaving a balance of $386,677.38.

Future Efforts

In October, the Preliminary Design Review will be held. Following this complete data reduction will proceed. Further reviews will be scheduled at the review.

Respectfully submitted,

R. E. Thomas
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

RET/dga

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

12 November 1979

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

Attention: Mr. Rick Yeager/PMZBB

Reference: F09603-78-G-4368 Order No. 0010

Subject: Monthly Status Report No. 2

Gentlemen:

A summary of the progress on the referenced contract for the period 1 October 1979 to 31 October 1979 is contained herein.

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

The Preliminary Design Review was held 5 October at Warner-Robins. Topics included revisions to the contract, data reduction methodology and test planning. The minutes of the meeting were submitted under separate cover.

Data reduction has continued during October. Most threat data has been extracted from intelligence files and reviewed. PRI plots have been prepared for preliminary analysis.

The following is a list of technical memoranda written to document work during September:

TM-2470-100-7	Staffing Requirements
TM-2470-100-8	Minutes-Preliminary Design Review (PDR)
TM-2470-020-2	Minutes PDR - Test Planning
TM-2470-040-5	Minutes PDR - Data Reduction Methodology

Efforts Expended

The following is the total effort expended, in man-hours, during the month of September.

Personnel	Man-Hours	
	Month	Cumulative
Thomas, R. E. Project Director	23	64
Creswell, R. E. Research Engineer II	164	312
Harbuck, A. C. Research Assistant I	66	76
Lipscomb, M. A. Research Engineer I	33	74
Miller, T. M. Sr. Res. Engineer	16	59
Rusk, T. P. Sr. Res. Engineer	14	14
Ryan, P. H. Research Engineer II	0	69
Spencer, W. D. Sr. Res. Engineer	0	52
Stroud, L. E. Sr. Res. Engineer	82	123
Thompson, W. K. Research Engineer I	37	48
Vogler, F. H. Research Scientist II	8	8
White, R. W. Research Engineer I	7	7
Zimmer, R. P. Principal Research Engineer	0	8

In October 1979 a total of $14,797.05 was spent. The cumulative expenditures are $28,119.67. The project ceiling price is $400,000 leaving a balance of $371,880.33.

Future Efforts

In November, an intermediate review of data reduction efforts will be held. Data reduction is to be completed in December. EID coding will then begin in January.

Respectfully submitted,

R. E. Thomas
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

RET/dga

A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

20 December 1979

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB

REFERENCE: F09603-78-G-4368 Order No. 0010

SUBJECT: Monthly Status Report No. 3

Gentlemen:

A summary of the progress on the referenced contract for the period 1 November to 30 November 1979 is contained herein.

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

EES analyzed ALR-46 software to determine ELD structure and to determine the requirements for flow generation and coding. Data was extracted from the FMS threat data base and methods implemented for PRI plotting, ambiguity resolution, and EID flow preparation. Detailed analysis of certain threats in the threat data base was performed in conjunction with the above efforts. Data on threat forms and PRI plots were changed based on technical inputs provided by WR-ALC.

Efforts have commenced to establish a test bed at EES to support EID coding.

Meetings

A project review was held on November 9, 1979 at WR-ALC. In attendance were:

Mr. John Louth	WR-ALC
Mr. W. Dean Spencer	GA Tech
Mr. Ronald Creswell	GA Tech
Mr. Larry E. Stroud	GA Tech
Mr. Rick Thomas	GA Tech
Mr. Ken Thompson	GA Tech

Questions were presented to WR-ALC by EES personnel with regards to the procedures to be used in interpreting threat data as applicable to the ALR-46. Answers were obtained regarding our questions as well as additional rules and procedures to be used on FMS subtasks.

The following is a list of technical memoranda written to document work during November:

TM-2470-040-6	Trip Report - 25 October 1979
TM-2470-040-7	Review Flow Generation Minutes
TM-2470-030-3	Ambiguity Resolution Procedures

Efforts Expended

The following is the total effort expended, in man-hours, during the month of November.

Personnel	Man-Hours Month	Man-Hours Cumulative
Thomas, R. E. Project Director	62	126
Creswell, R. E. Research Engineer II	176	488
Gibbons, J. R. Senior Research Engineer	18	18
Harbuck, A. C. Research Assistant I	90	166
Hedges, S. A. Student Assistant	15	15
Lipscomb, M. A. Research Engineer I	0	74
Miller, T. M. Senior Research Engineer	21	80
Mills, H. D. Co-op	54	54
Rusk, T. P. Senior Research Engineer	15	29
Ryan, P. H. Research Engineer II	68	137

Personnel	Man-Hours Month	Cumulative
Spencer, W. D. Senior Research Engineer	16	68
Stroud, L. E. Senior Research Engineer	71	194
Thompson, W. K. Research Engineer I	71	119
Vogler, F. H. Research Scientist II	62	70
White, R. W. Research Engineer I	0	7
Zimmer, R. P. Principal Research Engineer	0	8

Expenditures

In November 1979 a total of $11,487.16 was spent. The cumulative expenditures are $39,606.83. The project ceiling price is $400,000 leaving a balance of $360,393.17.

Future Efforts

In December extracting of threat data and updating of PRI plots will continue. Data compilation for ambiguity resolution and the preparation of EID flows will commence with initial efforts concentrated on the completion of the Band 1 threats. The development of a test bed suitable for EID coding will continue.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

RET/tas

A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

23 January 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 4
(December, 1979)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 December to 31 December 1979 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

Threat form analysis was continued and flows developed. All equipment has been ordered necessary to perform coding at EES. The EID User's Guide was obtained.

Technical Memoranda

Number	Date	Subject
TM-A-2470-040-8	18 December 1979	WR/ALC Meeting Minutes
TM-A-2470-040-9	18 December 1979	WR/ALC Classified Meeting Minutes

Meetings

Threat Form review and Project review meetings were held at WR-ALC on 10/11 December 1979. The technical sponsor was advised that the unanticipated repetitive review cycles on threat analysis and flow development were causing concern over the project schedule.

The Threat Form meeting produced additional new rules to follow and useful information regarding construction of flow charts.

Meeting attendees are noted in the attachment.

Efforts Expended

A summary of the professional and non-professional support efforts on this project through 31 December, 1979 is shown below.

	Man-Hours	
Professional Personnel	Month	Cumulative
Spencer, W. D. Senior Research Engineer	98	166
Creswell, R. E. Research Engineer II	157	645
Harrington, A. J. Research Engineer I	144	144
Lipscomb, M. A. Research Engineer I	152	226
Miller, T. M. Senior Research Engineer	16	96
Rusk, T. P. Senior Research Engineer	11	40
Stroud, L. E. Senior Research Engineer	115	309
Thomas, R. E. Research Engineer I	10	136
Thompson, W. K. Research Engineer I	41	160
Vogler, F. H. Research Scientist II	25	95
Support Personnel	142	142

Expenditures

Cumulative expenditures through 30 November, 1979 were $39,607. The project ceiling price is $400,000 leaving a balance of $360,393. Estimated expenditures during the month of December were $11,000.

Future Efforts

Work continues on Threat-Forms and Flows. It is expected that they should be completed in early February contingent on the number of reviews and development of additional rules.

The DP and processor equipment are expected to be in place and in process of being certified by security personnel.

A meeting is scheduled for 3/4 January 1980 to review forms and flows.

It will be necessary to review schedules closely with the sponsor to acquire a skeleton EID suitable for build-up, and have access to WR-ALC personnel and equipment as necessary to establish details of EID construction. This is particularly important because the EID Analyzer and Generator Manual (Comptek) will apparently not be available.

Schedule

The schedule is shown as an attachment. Efforts prior to 1 December 1979 are not indicated, and completion is based on the effort remaining as of that date. The expenditure chart does not take into account the balance in the presently unassigned fund of $185,000.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

RET/tas

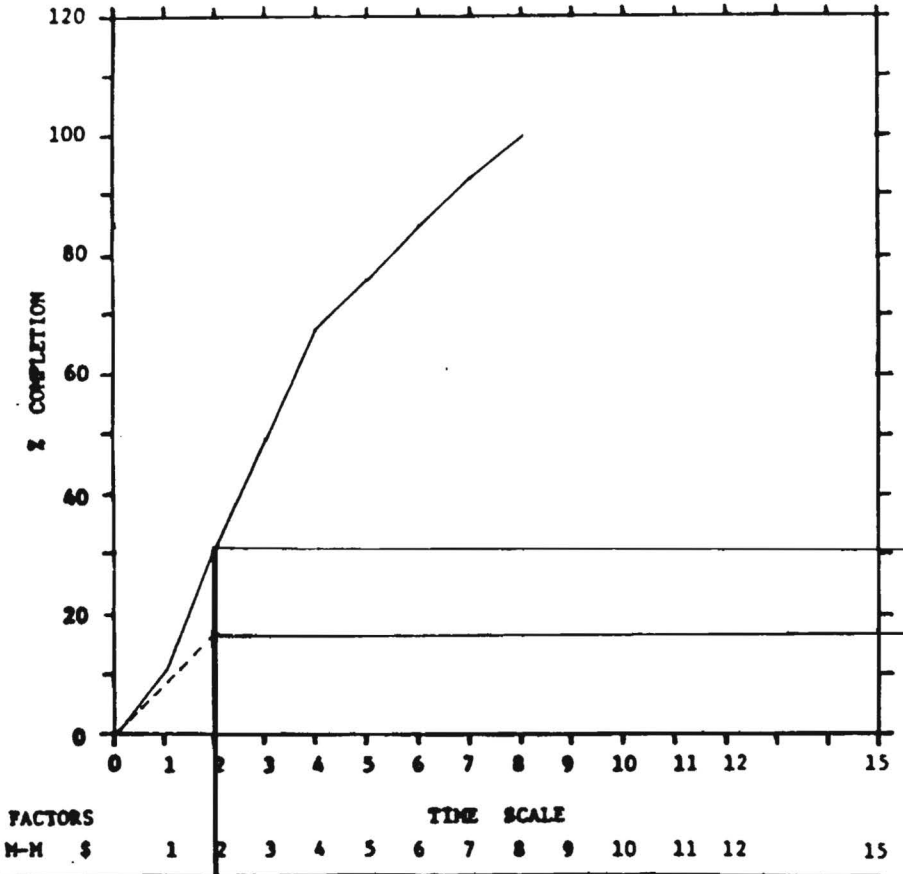
ATTENDEES AT MEETINGS

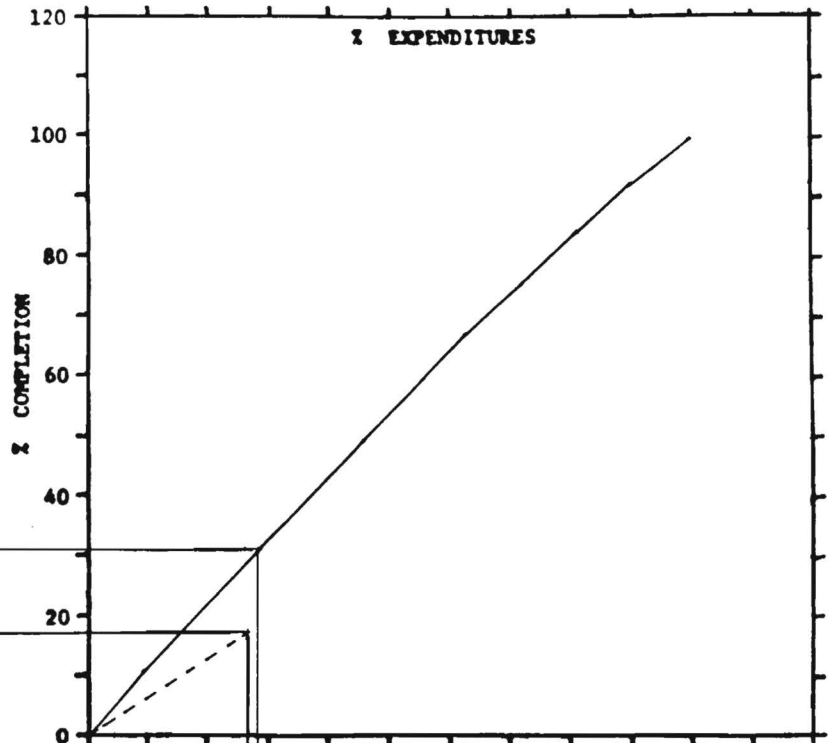
Date	Place	Present
10 December 1979	WR/ALC	John Louth, WR/ALC Capt. Woody Cousin, WR/ALC W. Dean Spencer, GA Tech Larry E. Stroud, GA Tech Ronald E. Creswell, GA Tech M. Andy Lipscomb, GA Tech
11 December 1979	WR/ALC	John Louth, WR/ALC Larry E. Stroud, GA Tech Ronald E. Creswell, GA Tech

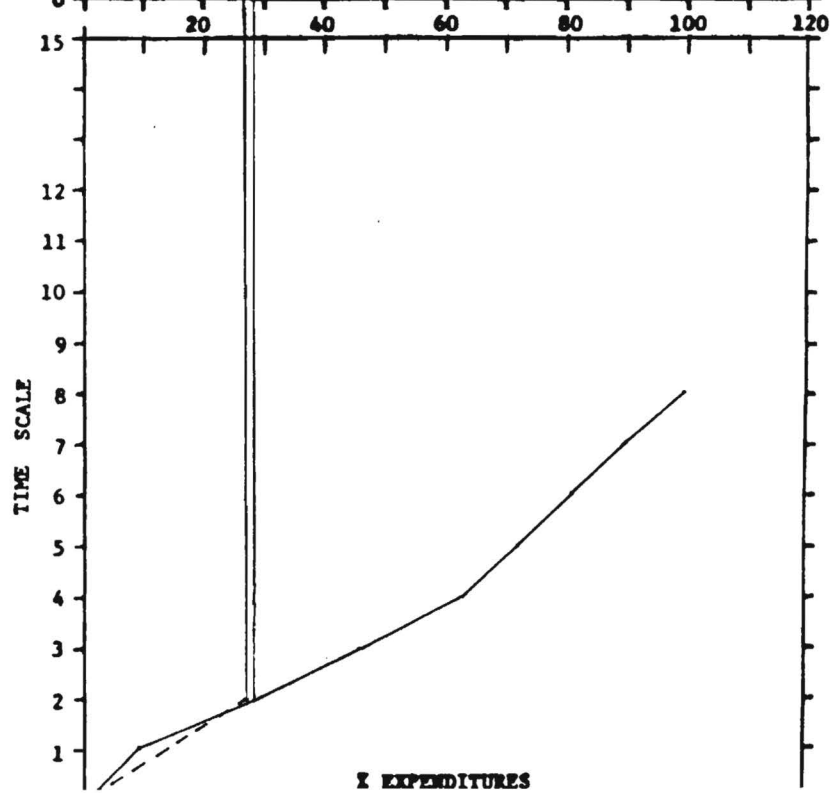
Date: 12/31/79
Project Name/Number:
F.M.S / A-2470
Project Director:
W. D. SPENCER
Scheduled Duration
12/1/79 – 3/31/80
Time Scale Units:
2 DIVISIONS / MONTH

Projected ——————

Actual - - - - - - - -







MILESTONES	FACTORS M-M	FACTORS $
1 RESERVE 000		
2 MANAGEMENT 100	.664	1308
3 MINICOMPUTER PROCUREMENT 010	.500	1125
4 TEST PLANNING 020	.125	281
5 METHODOLOGY 030	.360	810
6 FLOW GENERATION 040	2.08	2830
7 E.I.D CODING 050	1.20	2070
8 SYSTEM TEST 060	1.00	2249
9 UPDATE SOFTWARE T.O.'s 070	.295	551
10		

A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

5 February 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 5
(January 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 January to 31 January 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

Work continued on development of the forms necessary to carry out ambiguity resolutions. Band 1 forms have been approved; Band 0/2 Threat Forms have been approved and the rest delivered for review; Band 3 Threat Forms have been reviewed.

The coding has commenced, and Band 1 coding is nearly completed.

The System Test Plan and Acceptance Test Plan have been written and are being put into the correct format (IAW DI-T-3701A) for review by WR-ALC.

The necessary equipment for producing the paper tape to produce the EID end-item has been obtained and checked out. A decision has not yet been made whether or not to perform data entry at Georgia Tech or WR-ALC.

Documentation

I. Contract Data Requirements

The following is a list of Contract Data Requirements which were delivered during the month of January 1980 as specified in the statement of work.

Sequence Number	Description of Data
A003	Threat Forms/Flows, Ambiguity Analyses, PRI Plots, etc. (Classified: Sent under separate cover).
A004	Minutes of Formal Reviews, Inspections and Audits

II. Technical Memoranda

The following is a list of Technical Memoranda (TM) prepared through 31 January 1980, that are related to FMS. TM's are memoranda written for project files to document trip/meeting results, analyses, and project management efforts. These TM's are not specifically designated as items of delivery but serve the internal purpose of providing for communications, historical continuity, and reference for the project. However, they are available in whole or in part to the sponsor upon request.

Number	Date	Subject
A-2470-100-1	15 November 1979	Miscellaneous Correspondence Dated 5/8/79 to 9/26/79
A-2470-100-2	30 August 1979	FMS Statement of Work, 24 August 1979
A-2470-100-3	4 September 1979	Deliverables for Turkish FMS
A-2470-100-5	15 November 1979	Receipt of Delivery Order on BOA
A-2470-100-6	20 September 1979	Trip to WR/ALC - 10 and 11 September 1979
A-2470-100-7	2 October 1979	FMS Staffing Requirements
A-2470-100-8	18 October 1979	Preliminary Design Review
A-2470-100-9	15 November 1979	Contract Abstract from OCA

Number	Date	Subject
A-2470-100-10	10 January 1980	Data Requirements Meeting for FMS Contract - 9 January 1980
A-2470-010-1	20 July 1979	Equipment Requirements for ALR-46
A-2470-010-2	24 September 1979	Sole Source Justification for Nova Computer System
A-2470-020-1	10 July 1979	Test Configuration for ALR-46
A-2470-020-2	19 October 1979	Minutes of Test Planning Meeting No. 5
A-2470-030-1	24 September 1979	Reducing Threat Intelligence Data
A-2470-040-5	16 October 1979	Minutes of Meeting - 10/5/79
A-2470-040-6	30 October 1979	Trip Report of 10/25/79
A-2470-040-7	14 November 1979	Minutes of Meeting - 11/9/79
A-2470-040-8	18 December 1979	Minutes of Meeting - 10 and 11 December 1979
A-2470-040-9	18 December 1979	Classified Minutes of Meeting - 10 and 11 December 1979
A-2470-040-10	30 January 1980	Review Meeting at WR/ALC - 7 and 8 January 1980
A-2470-040-11	30 January 1980	Review Meeting at WR/ALC - 8 January 1980
A-2470-040-12	31 January 1980	Review Meeting at WR/ALC - 30 January 1980
A-2470-050-1	31 January 1980	Trip Reports of 22-24 January and 29-31 January 1980

Meetings

A series of six meetings were held at WR/ALC during January to review Threat Forms/Flows and other project progress. These meetings are described in the forwarding letter, "Minutes of Formal Reviews, Inspections and Audits" (A004) of 1 February 1980.

Attendees are listed in Attachment 1.

Efforts Expended

A summary of the professional and non-professional support efforts on this project during January, 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	102
Creswell, R. E. Research Engineer II	164
Harbuck, A. C. Research Assistant I	8
Harrington, A. J. Research Engineer I	39
Lipscomb, M. A. Research Engineer I	156
Mackey, G. F. Senior Research Engineer	41
Miller, T. M. Senior Research Engineer	74
Rusk, T. P. Senior Research Engineer	31
Stroud, L. E. Senior Research Engineer	156
Thompson, W. K. Research Engineer I	13
Vogler, F. H. Research Scientist II	73
Technical Support Personnel	632

Expenditures

Cumulative expenditures through 31 December 1979 were $67,603. The project ceiling price is $400,000 leaving a balance of $332,397. Estimated expenditures during the month of January were $24,000.

Future Efforts

During February coding will be accomplished, test planning reviewed and revised, Threat Forms/Flows will be completed, and testing begun. A report on EID development from Threat Forms to coding will begin and will incorporate all the decision rules developed during the course of the contract.

Schedule

The schedule has slipped significantly, primarily because of the numerous reviews required to arrive at acceptable Threat Forms/Flows. However, it is anticipated that the original contract end date is realistic for delivery of the EID end item. Date of delivery of T.O. source data depends on other schedule completion and receipt of the T.O.'s from WR-ALC that are to be modified, however; as indicated in TM-2470-100-10, EES will plan to deliver the source data by 15 April 1980.

The attached completion/expenditure sheet (Attachment II) remains based on a 31 March 1980 schedule for all tasks. It indicates a completion of 31% and reflects work to be accomplished beginning 1 December 1979.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

RET/tas

ATTENDEES AT MEETINGS

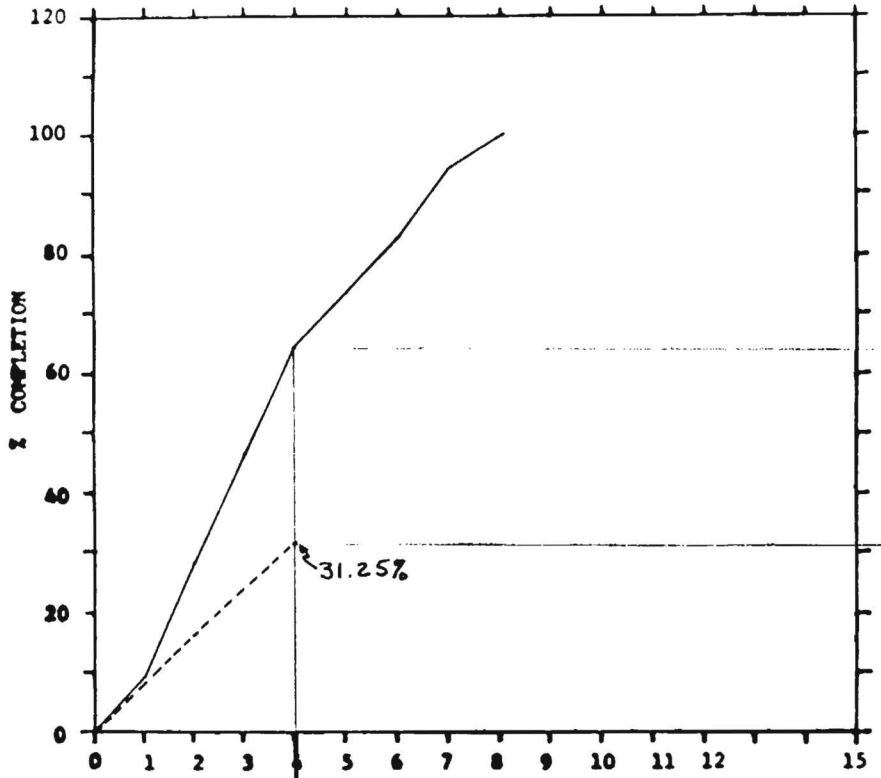
Date	Place	Present
7-8 January 1980	WR-ALC	J. Louth, WR-ALC W. D. Spencer, GA Tech L. E. Stroud, GA Tech M. A. Lipscomb, GA Tech R. E. Creswell, GA Tech T. P. Rusk, GA Tech
8 January 1980	WR-ALC	J. Black, WR-ALC T. Batterman, WR-ALC J. Dyal, WR-ALC T. M. Miller, GA Tech W. D. Spencer, GA Tech T. P. Rusk, GA Tech
9 January 1980	WR-ALC	A. Akin, WR-ALC G. Mouzon, WR-ALC A. Harbuck, GA Tech T. P. Rusk, GA Tech
30 January 1980	WR-ALC	J. Louth, WR-ALC L. E. Stroud, GA Tech M. A. Lipscomb, GA Tech W. D. Spencer, GA Tech
22-24 January 1980	WR-ALC	J. Louth, WR-ALC Capt. E. Cousin, WR-ALC T. M. Miller, GA Tech F. H. Vogler, GA Tech M. A. Lipscomb, GA Tech
29-31 January 1980	WR-ALC	J. Louth, WR-ALC Capt. E. Cousin, WR-ALC W. D. Spencer, GA Tech F. H. Vogler, GA Tech M. A. Lipscomb, GA Tech L. E. Stroud, GA Tech M. D. Rucker, GA Tech

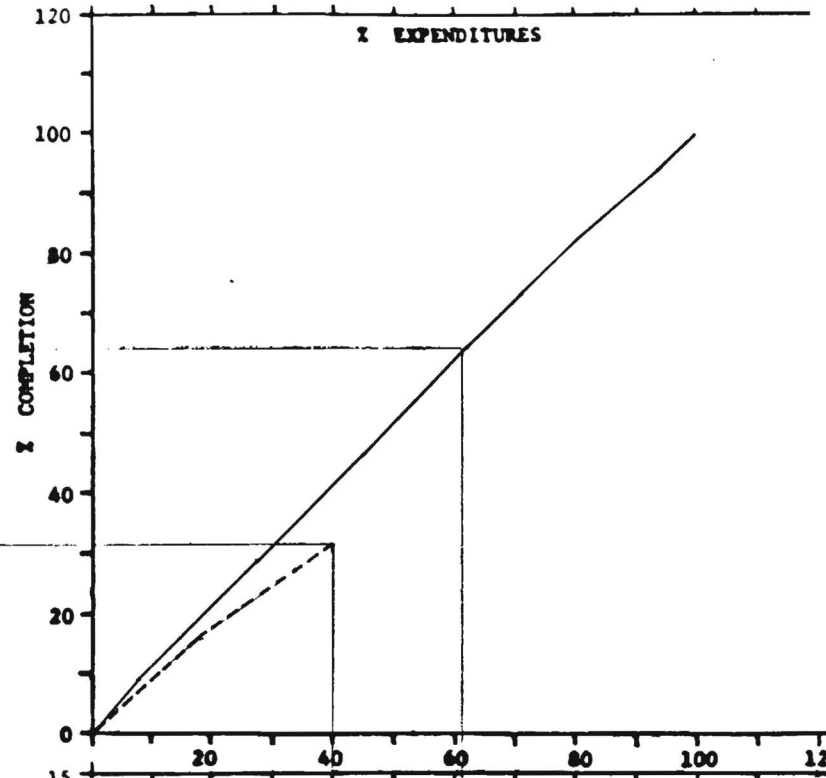
ATTACHMENT 1

Date:	1/31/80
Project Name/Number:	
F.M.S. / A-2470	
Project Director:	
W. D. SPENCER	
Scheduled Duration	
12/1/79 – 3/31/80	
Time Scale Units:	
2 DIVISIONS / MONTH	

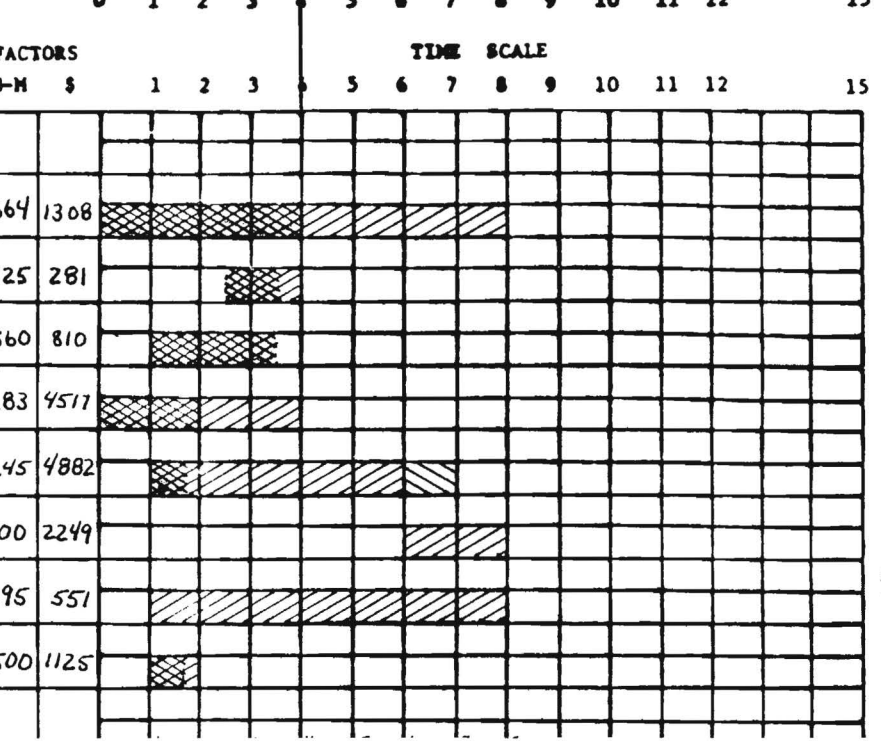
Projected ——————

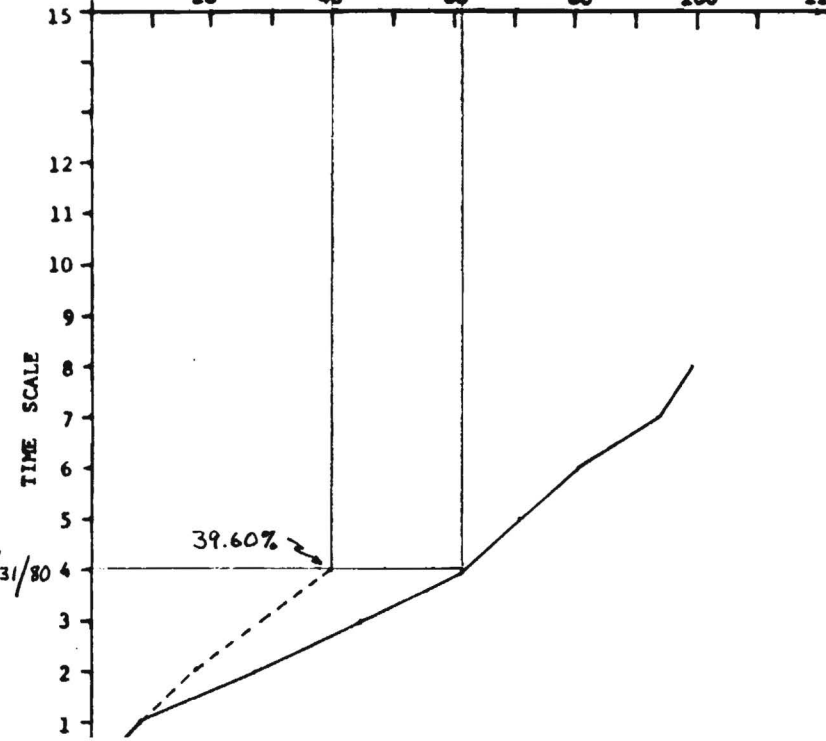
Actual - - - - - - - -





MILESTONES	FACTORS M-M	FACTORS $
000 1 RESERVE		
100 2 MANAGEMENT	.664	1308
020 3 TEST PLANNING	.125	281
030 4 METHODOLOGY	.360	810
040 5 FLOW GENERATION	2.83	4517
050 6 E.I.D. CODING	2.45	4882
060 7 SYSTEM TEST	1.00	2249
070 8 UPDATE SOFTWARE T.O.'s	.295	551
080 9 MINICOMPUTER DEVELOPMENT	.500	1125
10		





Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

7 March 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
GA Tech Project No. A-2470
Turkish AN/ALR-46

SUBJECT: Monthly Status Report No. 6
(February 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 February to 29 February 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

During February, work continued to complete all Threat Forms, PRI Plots, and Flows (Resolves). These have all been approved and the final delivery will be an enclosure to the March Engineering Services Report.

EES project personnel familiarized themselves with the test station (ISS) to be used for system testing of the assembled EID.

A draft of the Systems Test Plan and Acceptance Test Plan was submitted to WR/ALC for a review on 28 February 1980.

Documentation

The following is a list of Technical Memoranda (TM) prepared through 29 February 1980, that are related to FMS. TM's are memoranda written for project files to document trip/meeting results, analyses, and project management efforts. These TM's are not specifically designated as items of delivery but serve the internal purpose of providing for communications, historical continuity, and reference for the project. However, they are available in whole or in part to the sponsor upon request.

Number	Date	Subject
A-2470-100-1	15 November 1979	Miscellaneous Correspondence Dated 5/8/79 to 9/26/79
A-2470-100-2	30 August 1979	FMS Statement of Work, 24 August 1979
A-2470-100-3	4 September 1979	Deliverables for Turkish FMS
A-2470-100-5	15 November 1979	Receipt of Delivery Order on BOA
A-2470-100-6	20 September 1979	Trip to WR/ALC - 10 and 11 September 1979
A-2470-100-7	2 October 1979	FMS Staffing Requirements
A-2470-100-8	18 October 1979	Preliminary Design Review
A-2470-100-9	15 November 1979	Contract Abstract from OCA
A-2470-100-10	10 January 1980	Data Requirements Meeting for FMS Contract - 9 January 1980
A-2470-100-11	30 January 1980	Report of Review Meeting At WR/ALC on 8 January 1980
A-2470-100-12	29 February 1980	Report of Progress Review Meetings at WR/ALC on 28 February 1980
A-2470-010-1	20 July 1979	Equipment Requirements for ALR-46
A-2470-010-2	24 September 1979	Sole Source Justification for Nova Computer System
A-2470-020-1	10 July 1979	Test Configuration for ALR-46

Number	Date	Subject
A-2470-020-2	19 October 1979	Minutes of Test Planning Meeting No. 5
A-2470-030-1	24 September 1979	Reducing Threat Intelligence Data
A-2470-040-5	16 October 1979	Minutes of Meeting - 10/5/79
A-2470-040-6	30 October 1979	Trip Report of 10/25/79
A-2470-040-7	14 November 1979	Minutes of Meeting - 11/9/79
A-2470-040-8	18 December 1979	Minutes of Meeting - 10 and 11 December 1979
A-2470-040-9	18 December 1979	Classified Minutes of Meeting - 10 and 11 December 1979
A-2470-040-10	30 January 1980	Review Meeting at WR/ALC - 7 and 8 January 1980
A-2470-040-11	30 January 1980	Review Meeting at WR/ALC - 8 January 1980
A-2470-040-12	31 January 1980	Review Meeting at WR/ALC - 30 January 1980
A-2470-050-1	31 January 1980	Trip Reports of 22-24 January and 29-31 January 1980
A-2470-050-2	14 February 1980	Classified Minutes of Meeting at WR/ALC on 14 February 1980

Meetings

A series of three meetings were held at WR/ALC during February to review project progress and discuss an appropriate completion schedule for the remainder of the project. A proposed no-cost extension was examined, however the details of such an extension are not completely resolved.

These meetings are described in TM's A-2470-100-12 and A-2470-050-2. Attendees are listed in Attachment I.

Efforts Expended

A summary of the professional and non-professional support efforts on this project during February, 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	115
Brown, D. T. Research Engineer I	7
Creswell, R. E. Research Engineer II	163
Cockerham, B Research Scientist I	164
Harbuck, A. C. Research Assistant I	10
Harrington, A. J. Research Engineer I	82
Larkin, D. M. Research Engineer I	164
Mackey, G. F. Senior Research Engineer	41
Miller, T. M. Senior Research Engineer	54
Rusk, T. P. Senior Research Engineer	13
Stroud, L. E. Senior Research Engineer	160
Vogler, F. H. Research Scientist II	14
Technical Support Personnel	840

Expenditures

Cumulative expenditures through 31 January 1980 were $97,053. Estimated expenditures during February were $45,174. The project ceiling price is $400,000 leaving an estimated free balance of $257,773 at the end of February. Attachment II provides a graphical display of expenditures vs. time from 1 December 1979 to the present.

Schedule

Coding should be completed, flows proofed, and an EID assembled by 7 March 1980. System testing is expected to begin 10 March 1980. Proms are expected to be burned-in on 24, 25 March. The Acceptance Test will be performed 26-28 March.

T. O. source data will be provided by 15 April in a form useable by the Technical Services group at WR/ALC for T. O. updating.

Discusssions with WR/ALC technical sponsors have resulted in a tentative agreement to extend the period of the contract to 31 July 1980 at no additional cost and with previously agreed upon amendments.

The attached completion/expenditure sheet (Attachment II) provides a schedule of work to be completed beginning 1 December 1979 and extending through July 1980. It indicates a current completion of 50% and shows levels of accomplishment in the individual project milestones.

Future Efforts

Final proofing and production of Threat Forms/Flows will be done in order to deliver by 31 March 1980. The EID will be assembled, exercised, and tested at WR/ALC. Proms will be burned and the Acceptance Test run by 31 March.

EES will review those portions of applicable Technical Orders (T.O's) for possible changes and supply source data for any changes to WR/ALC.

After EID delivery, a documentation effort will begin to produce a Final Report incorporating all general principles, rules, and detailed analyses used in deriving Threat Flows as well as recommendations for an improved methodical approach to EID development.

Some signal analysis will be done to verify threat analysis conclusions as applied to AN/ALR-46 decision making.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

tas

ATTENDEES AT MEETINGS

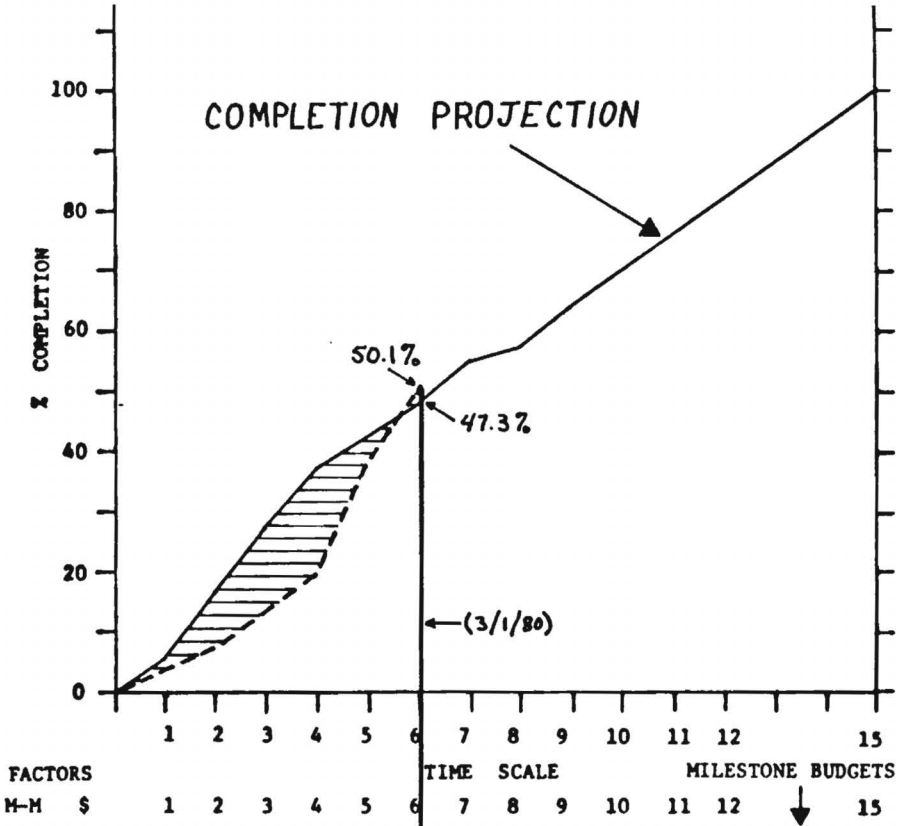
Date	Place	Present
14 February 1980	WR/ALC	John Louth, WR/ALC W. Dean Spencer, EES Larry Stroud, EES M. Andrew Lipscomb, EES Ronald E. Creswell, EES
28 February 1980 (AM)	WR/ALC	John Louth, WR/ALC W. Dean Spencer, EEs Tom Miller, EES Larry Stroud, EES Pat Rusk, EES
28 February 1980 (PM)	WR/ALC	George Mauzon, WR/ALC Robert McGill, WR/ALC WR/ALC Capt. E. Cousin, WR/ALC W. Dean Spencer, EES

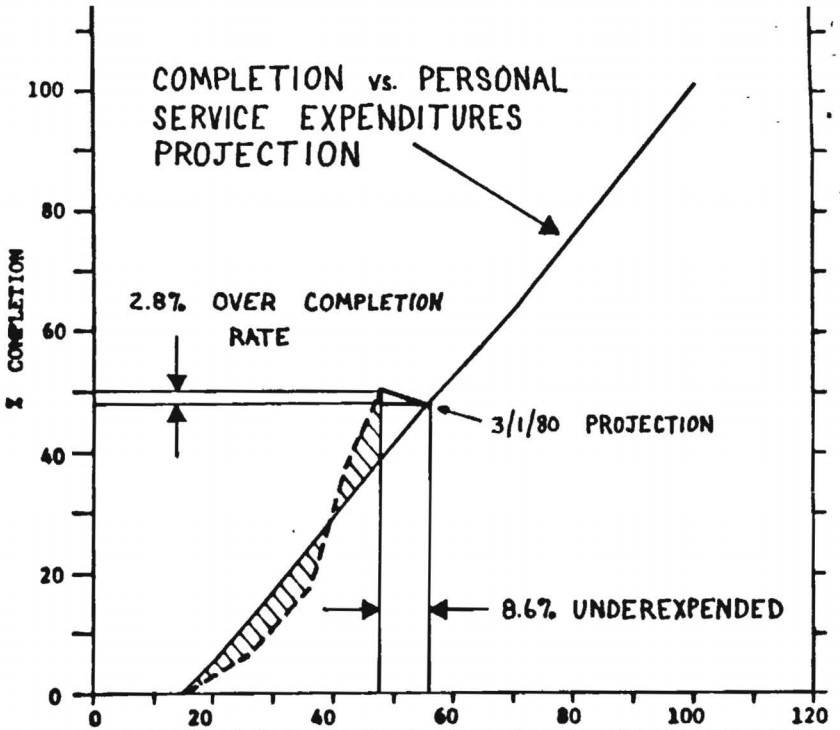
ATTACHMENT I

Date:	1 MARCH '80
Project Name/Number:	
	F.M.S. / A-2470
Project Director:	
	W. D. SPENCER
Scheduled Duration	
	12/1/79 - 7/15/80
Time Scale Units:	
	2 DIVISIONS/MONTH

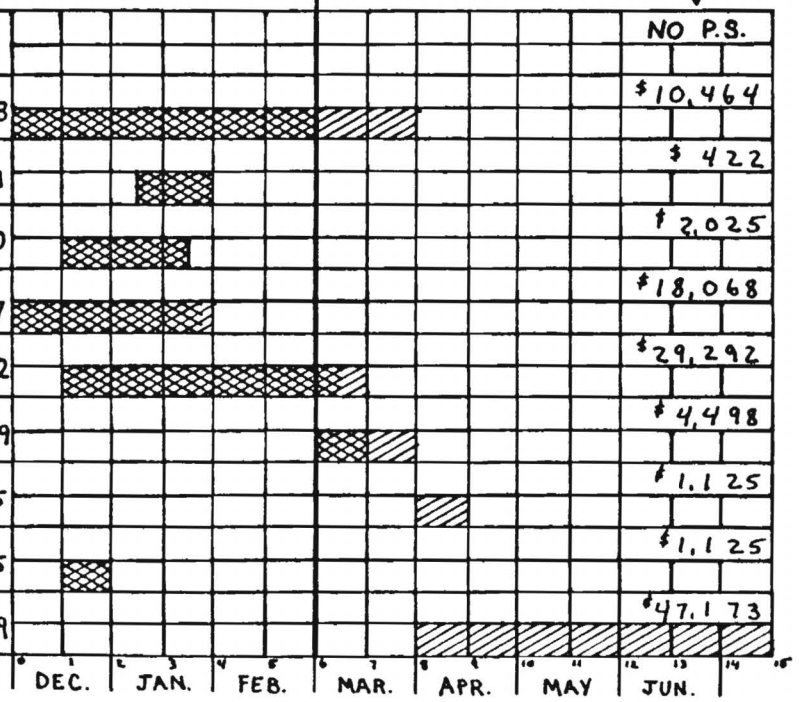
Projected ——————

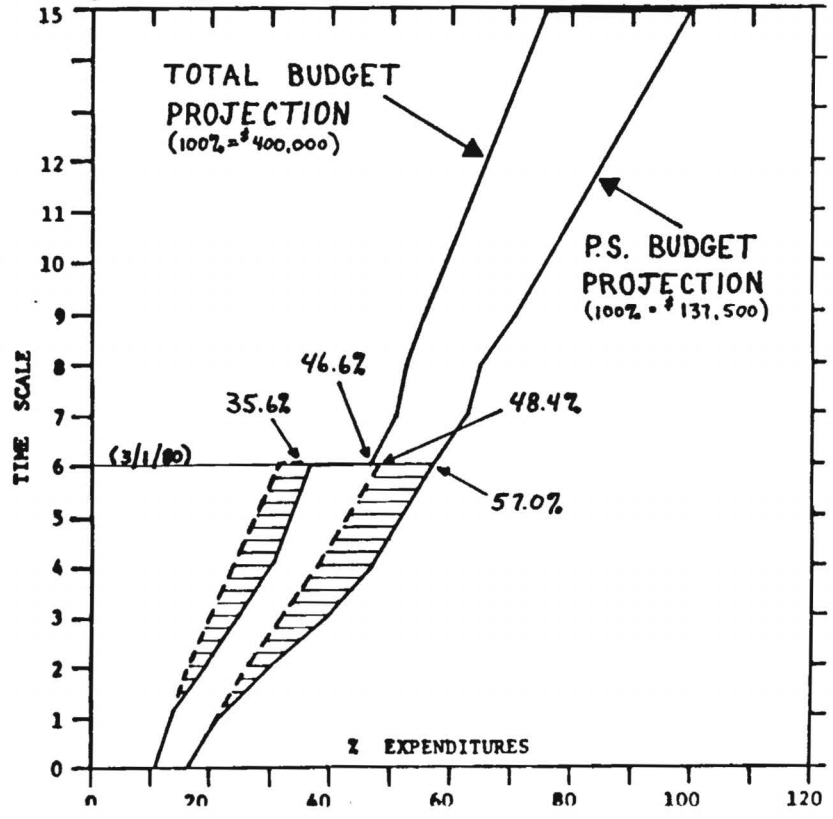
Actual - - - - - - - -





MILESTONES	FACTORS M-M	FACTORS $	MILESTONE BUDGETS
1 RESERVE			NO P.S.
2 MANAGEMENT	.664	1308	$10,464
3 TEST PLANNING	.125	281	$ 422
4 METHODOLOGY	.360	810	$ 2,025
5 FLOW GENERATION	2.83	4517	$18,068
6 EID CODING	2.45	4882	$29,292
7 SYSTEM TEST	1.00	2249	$ 4,498
8 UPDATE SOFTWARE T.O.'s	.500	1125	$ 1,125
9 MINICOMPUTER DEVELOPMENT	.500	1125	$ 1,125
10 FINAL REPORT	3.50	6739	$47,173





ATTACHMENT II

SUB-PROJECT BUDGETS

ACCOUNT #	SUB-BUDGET TITLE	BUDGET INCLUDES	BUDGET
A-2470-000	RESERVE	TRAVEL, M.&S., (No P.S.)	$108,463
A-2470-100	MANAGEMENT	P.S., OVERHEAD, RETIREMENT	$ 27,118
A-2470-020	TEST PLANNING	P.S., OVERHEAD, RETIREMENT	$ 4,017
A-2470-030	METHODOLOGY	P.S., OVERHEAD, RETIREMENT	$ 9,498
A-2470-040	FLOW GENERATION	P.S., OVERHEAD, RETIREMENT	$ 50,722
A-2470-050	EID CODING	P.S., OVERHEAD, RETIREMENT	$ 54,633
A-2470-060	SYSTEM TEST	P.S., OVERHEAD, RETIREMENT	$ 8,389
A-2470-070	UPDATE SOFTWARE T.O.'s	P.S., OVERHEAD, RETIREMENT	$ 2,098
A-2470-080	MINICOMPUTER DEVELOPMENT	CAPITAL OUTLAY, P.S., OVER., RET.,	$ 47,080
	FINAL REPORT	P.S., OVERHEAD, RETIREMENT	$ 87,982
		TOTAL	$400,000

A-2470

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

7 April 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
Turkish AN/ALR-46 Software
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 7
(March 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 March to 31 March 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

EES personnel were on-site at the ALR-46 mock-up during the month of March. Two shifts were employed where appropriate in order to most effectively utilize equipment and personnel.

During this period, a continuing review and revision of threat forms, plots, resolves, etc. took place with the assistance of Mr. John Louth of WR/ALC. Coding and editing continued and several versions of an EID were produced.

A final version was ready for verification testing on 17 March and the complete EID was tested for correspondence to threat data and resolves by 25 March. This testing included use of EWOLS for conditions in which guidance signals were required. During testing, revisions were made as necessary. In addition a random selection of threats were taken directly from original sources and inputted to the system to examine the capability of the ALR-46 with the new EID to respond correctly to "real world" signals.

Following this testing, the PROMS were burned and the system checked in a full acceptance test ending 26 March 1980.

At the conclusion of acceptance testing the following items were left with WR/ALC.

Final corrected EID listings
EID source tapes and a binary tape
Set of burned-in PROMS containing EID

The following items had been completed but need revisions and smooth copy made:

Threat Forms
PRI/SCAN plots
Resolve flows
Coding sheets

In addition the SM-568/683/684 RF simulators (Squirt Boxes) were exercised against the system and the symbology for all conditions noted. Also, during acceptance testing, TO 12P3-2ALR46-48-1, which provides test instructions for using the AN/APM-379 signal processor test set, was updated in accordance with instructions given by WR/ALC personnel.

Documentation

I. Contract Data Requirements

The following is a list of contract data requirements which were delivered during the month of March 1980 as specified in the statement of work.

Sequence Number	Description of Data
A00A	System Test Plan

II. Technical Memoranda

The following is a list of Technical Memoranda (TM) prepared through 31 March 1980, that are related to FMS. TM's are memoranda written for project files to document trip/meeting results, analyses, and project management efforts. These TM's are not specifically designated as items of delivery but serve the internal purpose of providing for communications, historical continuity, and reference for the project. However, they are available in whole or in part to the sponsor upon request.

(Because of the continuing on-site review and coding/testing effort, details and records were kept in project notebooks for inclusion in the final report).

Meeting

A planning/review meeting was held on 24 March 1980 with Dean Spencer, Larry Stroud and Ron Creswell of EES and Tom Batterman of WR/ALC. A short status review took place and an agreement was reached to meet again in early April.

Efforts Expended

A summary of the professional and non-professional support efforts on this project during March 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	141
Cockerham, B. Research Scientist I	144
Creswell, R. E. Research Engineer II	164
Harrington, A. J. Research Engineer I	115
Larkin, D. M. Research Engineer I	62
Mackey, G. F. Senior Research Engineer	49
Miller, T. M. Senior Research Engineer	16
Rusk, T. P. Senior Research Engineer	7
Stroud, L. E. Senior Research Engineer	163
Technical Support Personnel	785

Expenditures

Cumulative expenditures through 29 February 1980 were $154,964. Estimated expenditures during March were $31,036. The project ceiling price is $400,000 leaving an estimated free balance of $214,000 at the end of March. Attachment I provides a graphical display of expenditures vs. time from 1 December 1979 to the present.

Schedule

T. O. source data will be submitted by 15 April. This data will be in a form usable to determine revisions needed to applicable T. O.'s. Final threat forms, PRI/Scan plots and resolves for all threats and bands will be delivered prior to 30 April.

A meeting in this same period will determine the structure of the final report.

The attached completion expenditure sheet indicates a completion of 58%.

All critical milestones have been met and the project is on schedule.

Future Efforts

Delivery of T. O. source data and final forms remains as an immediate task. EES plans to include test results in the final report.

EES understands that a no cost extension to 31 July 1980 and an amended SOW are in process of delivery to EES. This amendment includes a deliverable of Display Interpretation; i.e., symbology vs. threat as a function of file being used. This will be delivered in the 15 to 22 April time frame.

The final report is planned to be done in increments that can be reviewed on a bi-weekly basis; however, the format and extent will be determined in April by WR/ALC.

Miscellaneous

The amount of classified material now existing and to be generated during Final report generation requires a large amount of temporary dedicated storage. It would appear to be an appropriate expenditure of available capital funds for WR/ALC to approve purchase of a GSA approved security container for the remainder of the contract.

The assistance of Mr. Louth, Capt. Cousin, Mr. Sheets, Mr. Lee and Mr. Bankhead and several other WR/ALC engineers was critical to the on-time delivery of the completed EID. Their availability and patience was deeply appreciated.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

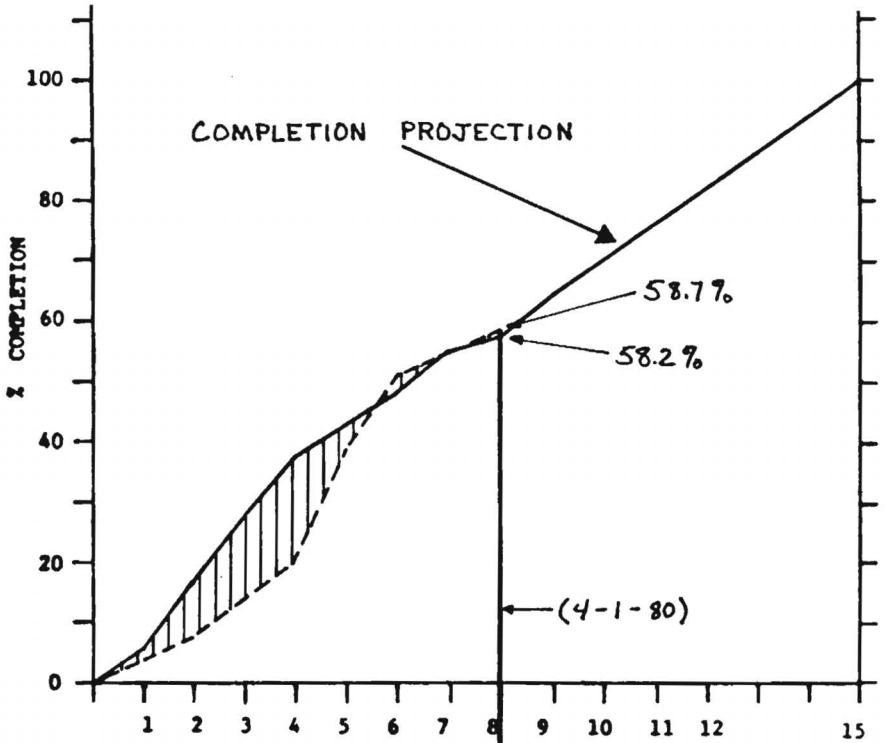
Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

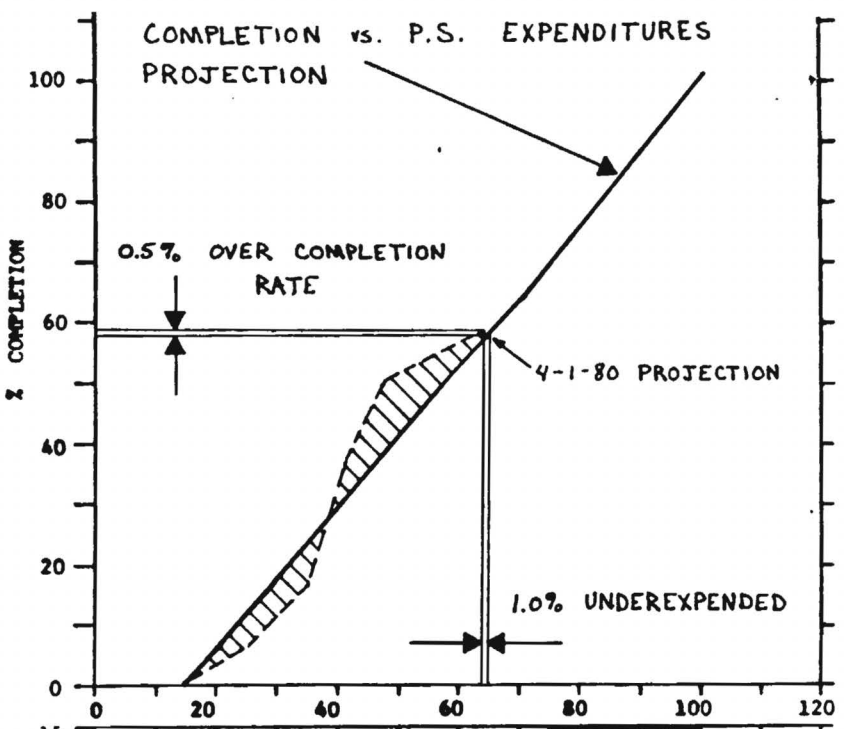
tas

Project Name/Number:
F.M.S./ A-2470
Project Director:
W. D. SPENCER
Scheduled Duration
12/1/79 – 7/15/80
Time Scale Units:
2 DIVISIONS / MONTH

Projected ——————

Actual - - - - - - -



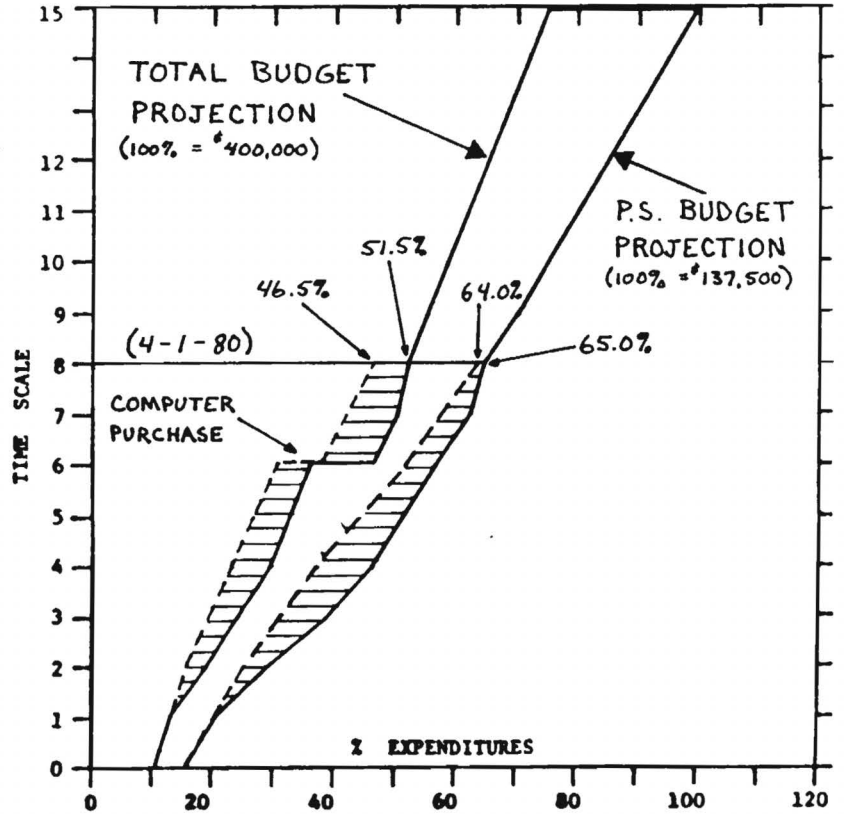


MILESTONES	FACTORS M-M	FACTORS $	MILESTONE BUDGETS
1 RESERVE			NO P.S.
2 MANAGEMENT	.664	1308	$10,464
3 TEST PLANNING	.125	281	$422
4 METHODOLOGY	.360	810	$2,025
5 FLOW GENERATION	2.83	4517	$18,068
6 EID CODING	2.45	4882	$29,292
7 SYSTEM TEST	1.00	2249	$4,498
8 UPDATE SOFTWARE T.O.'s	.500	1125	$1,125
9 MINICOMPUTER DEVELOPMENT	.500	1125	$1,125
10 FINAL REPORT	3.50	6739	$47,173

TIME SCALE

1 2 3 4 5 6 7 8 9 10 11 12 15

DEC. JAN. FEB. MAR. APR. MAY JUN.



Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

5 May 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
Turkish AN/ALR-46 Software
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 8
(April 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 April to 30 April 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

Analyses of the EID test results and display interpretations, preparation of the test report and the processing of threat forms, PRI and scan plots and resolves into final form represented a major effort during April. This effort resulted in the following items which are being delivered:

1. Acceptance Test Report (2 copies)
2. Service Engineering Report (2 copies)
3. Edited T.O. 12P3-2ALR46-48-1 (2 copies)
4. Final EID Listing (1 copy)

Work on the final report outline and preliminary report writing commenced during this period.

Documentation

I. Contract Data Requirements

The following is a list of contract data requirements which were delivered during the month of April 1980 as specified in the statement of work.

Sequence Number	Description of Data
A003	Service Engineering Report
A006	Acceptance Test Report

II. Technical Memoranda

The following is a list of Technical Memoranda (TM) prepared through 30 April 1980, that are related to FMS.

Number	Date	Subject
TM-2470-000-1	23 April 1980	FMS Meeting at WR/ALC on 22 April 1980

Meetings

A planning/review meeting was held at WR/ALC on 22 April 1980. The objectives of this meeting were to coordinate a preliminary FMS report outline and to discuss potential FMS tasks which may be accomplished with currently available funds. It was agreed that the Georgia Tech FMS team would further refine the report outline and develop a schedule with proposed milestones for presentation at the next project review which is tentatively scheduled for the week of 5 May 1980. Attendees of the 22 April meeting are listed in Attachment I.

Efforts Expended

A summary of the professional and non-professional support efforts on this project during April 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	176

Professional Personnel (Cont.)	Man-Hours
Cockerham, B. Research Scientist I	176
Creswell, R. E. Research Engineer II	162
Lipscomb, M. A. Research Scientist I	160
Mackey, G. F. Senior Research Engineer	9
Stroud, L. E. Senior Research Engineer	132
Vogt, J. V. Research Engineer I	14
White, R. W. Research Engineer I	70
Zimmer, R. P. Principal Research Engineer	35
Technical Support Personnel	457

Expenditures

Cumulative expenditures through 31 March 1980 were $189,743. Estimated expenditures during April were $23,000. The project ceiling price is $400,000 leaving an estimated free balance of $187,257 at the end of April.

Schedule

During May the initial section of the Final Report will be completed.

The attached completion/expenditure chart (Attachment II) indicates a completion of 70% at the present time. All criticial milestones scheduled for completion prior to 1 May 1980 have been met and the project is on schedule.

Future Efforts

Work will continue on the Final Report. EES will also validate the EID design by selected signal and weapon system analyses. These design review analyses will be written up as Technical Memoranda and supplied to WR/ALC as requested to insure confidence in the final EID configuration.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

tas

ATTENDEES AT MEETING

Date	Place	Present
22 April 1980	WR/ALC	Lt. Col. Wise, WR/ALC
		Capt. Cousin, WR/ALC
		William Peters, WR/ALC
		Dave Rothery, WR/ALC
		Dean Spencer, EES
		Larry Stroud, EES
		Ron Creswell, EES
		Andy Lipscomb, EES

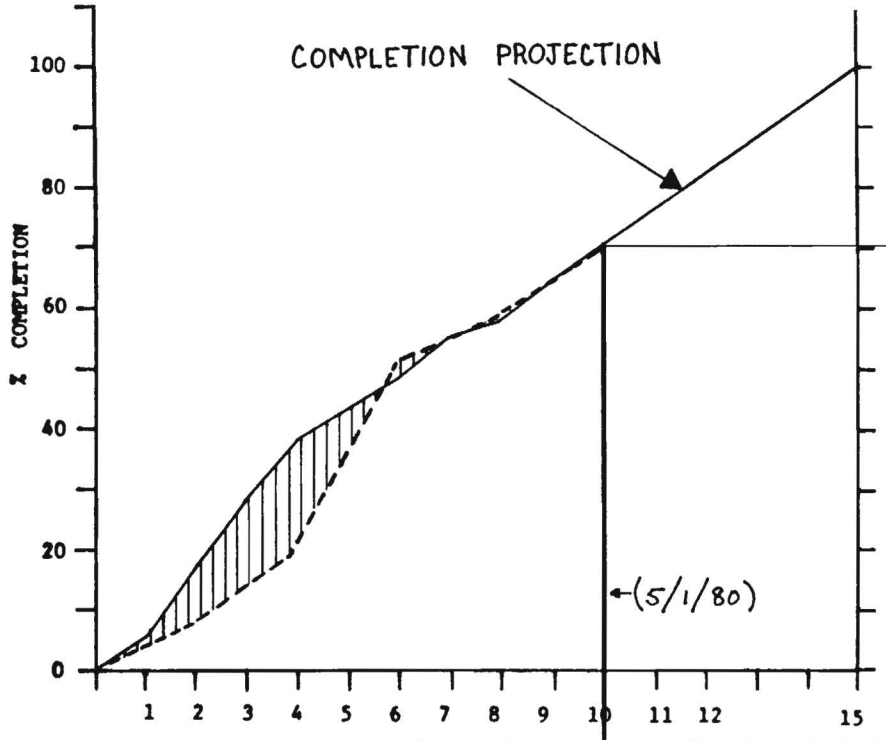
ATTACHMENT I

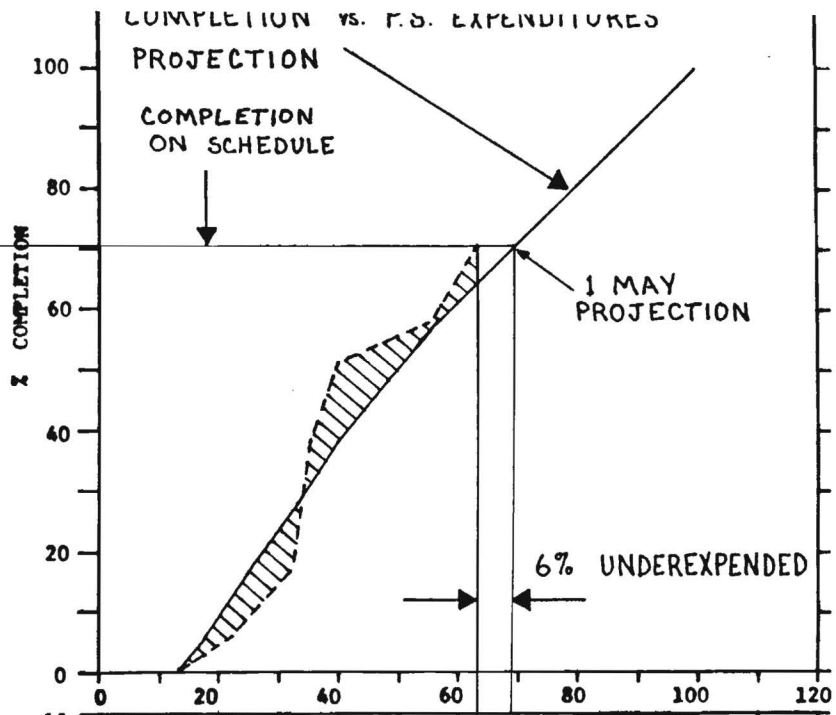
ATTACHMENT II

Project Name/Number:
F.M.S. - A/2470
Project Director:
W. D. SPENCER
Scheduled Duration
12/1/79 → 7/15/80
Time Scale Units:
2 DIVISIONS / MONTH

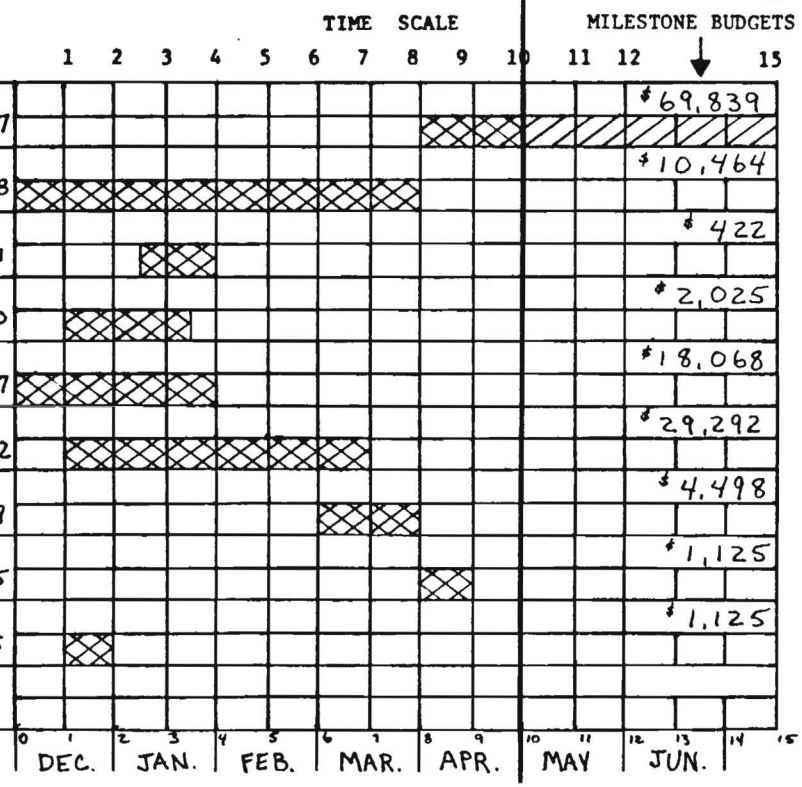
Projected ——————

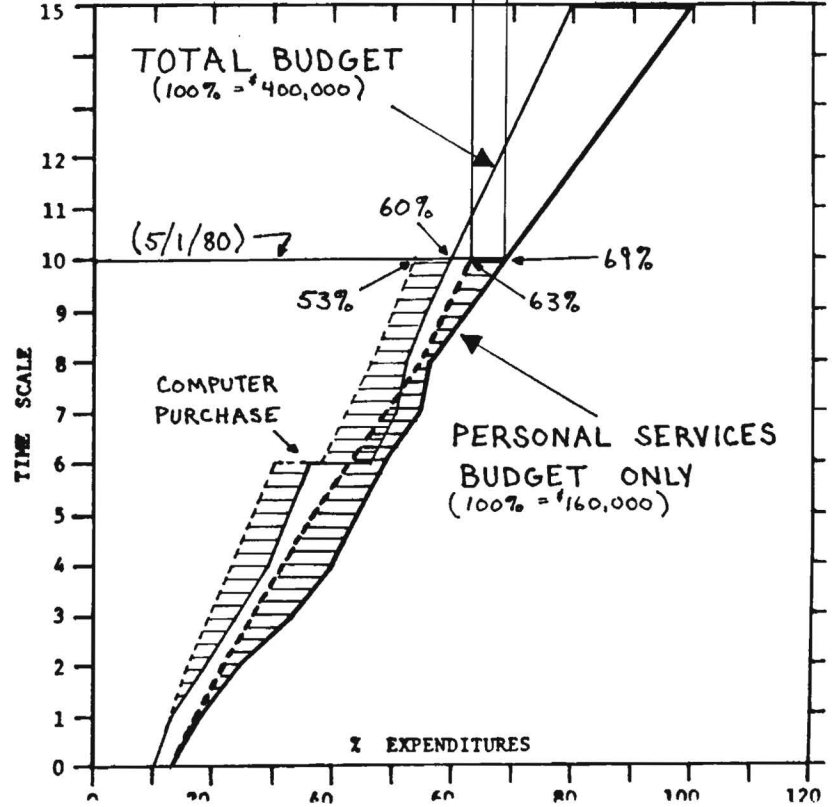
Actual - - - - - - -





MILESTONES	FACTORS M-M	FACTORS $	MILESTONE BUDGETS
1 FINAL REPORT	3.50	9977	$69,839
2 MANAGEMENT	.664	1308	$10,464
3 TEST PLANNING	.125	281	$422
4 METHODOLOGY	.360	810	$2,025
5 FLOW GENERATION	2.83	4517	$18,068
6 EID CODING	2.45	4882	$29,292
7 SYSTEM TEST	1.00	2249	$4,498
8 UPDATE SOFTWARE T.O.'s	.500	1125	$1,125
9 MINICOMPUTER DEVELOPMENT	.500	1125	$1,125
10			





A-2470

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

5 May 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
Turkish AN/ALR-46 Software
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 9
(May 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 May to 31 May 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

Preliminary report writing has occupied much of the effort during May. Section II of the Final Report has been 60% completed. A preliminary draft version of this section of EID construction policies, rules, and procedures is being prepared for delivery in early June.

Final Section II writing and preliminaries of other Final Report sections will occupy June.

Documentation

I. Technical Memoranda

The following is a list of Technical Memoranda (TM) prepared through 31 May 1980, that are related to FMS.

Number	Date	Subject
TM-2470-000-9	12 May 1980	FMS Meeting at WR/ALC on 7 May 1980
TM-2470-000-10	22 May 1980	Overview of the ALR-46 Operational Flight Program, Part I - Introduction and Discussion of Measurement Hardware

II. Documentation Delivered to Sponsor

The following is a list of Technical Memoranda which were delivered to WR/ALC during May as specifically requested.

A. Classified

Number	Date	Subject
TM-2470-030-3	4 December 1979	The Enclosed Ambiguity Resolution for the ALR-46
TM-2470-040-6	14 November 1979	Minutes of FMS Meeting on 9 Nov., 1979; Revised Flow Generation Work to Date for Turkish FMS
TM-2470-050-2	18 February 1980	Testing of FMS EID Software and EID Assembly Trip Report for 14 February 1980

B. Unclassified

Number	Date	Subject
TM-2470-000-1	23 April 1980	FMS Meeting at WR/ALC on 22 April 1980
TM-2470-020-1	10 July 1979	Test Configuration for ALR-46
TM-2470-030-1		Reducing Threat Intelligence Data
TM-2470-040-6	30 October 1979	Trip Report of 25 October 1979
TM-2470-040-7	14 November 1979	Minutes of FMS Meeting on 9 November 1979 -- Review Flow Generation Work to Date for Turkish FMS
TM-2470-100-6	20 September 1979	Trip to WR/ALC - 10 and 11 September 1979
TM-2470-100-12	29 February 1980	FMS Progress Review Meetings at WR/ALC on 28 February 1980

Meetings

An FMS planning/review meeting was held at WR/ALC on 7 May 1980. At this time the FMS Final Report outline, presented by EES, was discussed and the topics indicated were determined to be appropriate. Also discussed at this meeting were the project schedule and the possibility that new FMS task areas might later be identified. It was agreed that EES would present a "draft" set of rules at the next FMS meeting scheduled in June. Attendees of the 7 May meeting are listed in Attachment I.

Efforts Expended

A summary of the professional and non-professional support efforts on this project during May 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	136
Cockerham, B. Research Scientist I	176
Creswell, R. E. Research Engineer II	134
Harrington, A. J. Research Engineer I	53
Larkin, D. M. Research Engineer I	56
Lipscomb, M. A. Research Scientist I	114
Stroud, L. E. Senior Research Engineer	167
Vogler, F. H. Research Scientist	14
Technical Support Personnel	504

Expenditures

Cumulative expenditures through 30 April 1980 were $219,192. Estimated expenditures during May were $26,700. The project ceiling price is $400,000 leaving an estimated free balance of $154,108 at the end of May.

Schedule

During June the initial draft of each section of the Final Report excluding Appendices will be completed. The test EID portion of the EID is 50% completed to the coding phase.

The attached completion/expenditure chart (Attachment II) maps out the project milestones which remained uncompleted as of 1 April 1980. The chart indicates a completion of 17% of these tasks.

Future Efforts

The preliminary draft of Section II of the Final Report will be completed in early June. Construction of a Test EID will proceed. Coordination with WR/ALC personnel who assisted in the pre-April phase of FMS is likely to be necessary, especially in the Weapon System Analysis area.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

tas

ATTENDEES AT MEETING

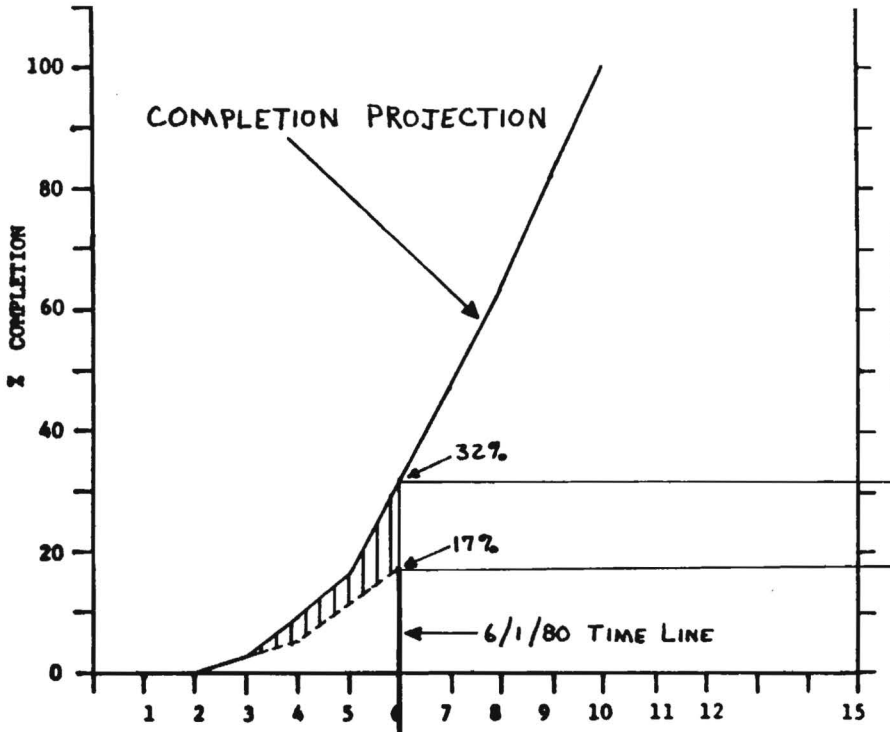
Date	Place	Present
7 May 1980	WR/ALC	Lt. Col. Wise, WR/ALC
		Capt. Cousin, WR/ALC
		Bill Peters, WR/ALC
		Larry Stroud, EES
		Ron Creswell, EES

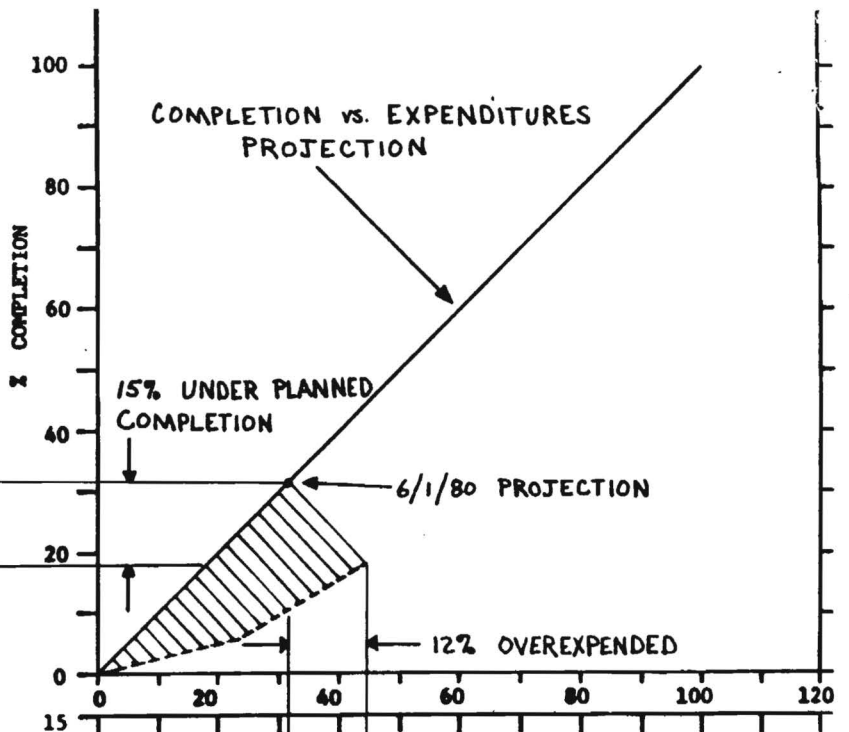
ATTACHMENT I

Project Name/Number:
FMS / A-2470
Project Director:
W. D. SPENCER
Scheduled Duration
1 MAR. – 31 JUL.
Time Scale Units:
2 DIVISIONS / MONTH

Projected ——————

Actual – – – – – –



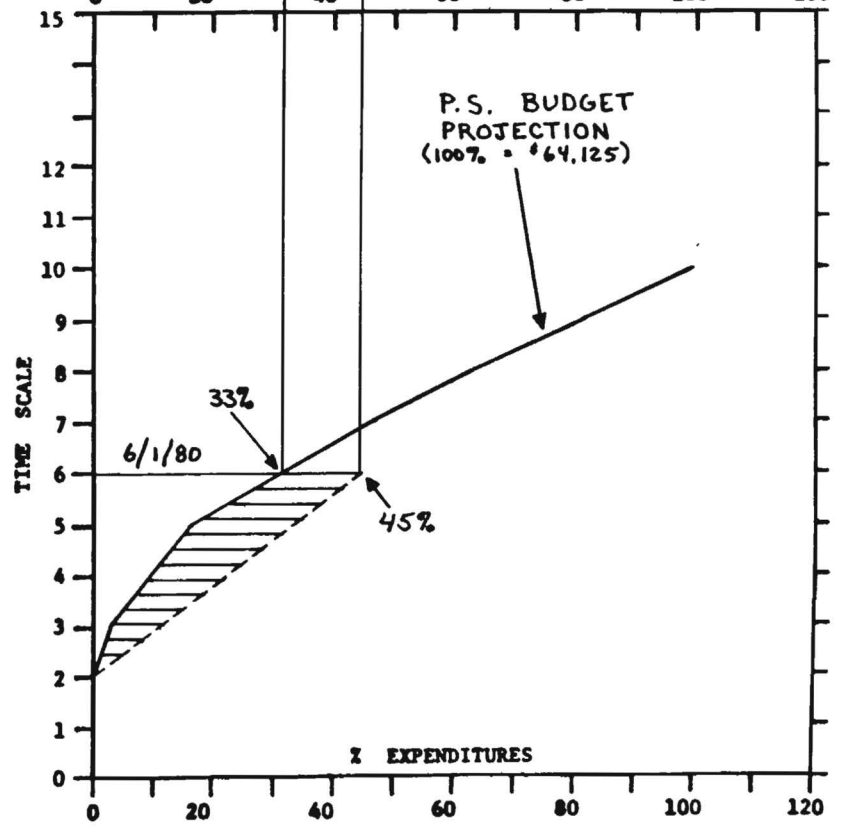


MILESTONES	FACTORS M-M	FACTORS $	MILESTONE BUDGETS
1 FINAL REPORT PREP.			
I. INTRO/GENERAL	.667	1500	$6,750
II. PROCEDURES/RULES	1.20	2700	$13,500
III. TESTING	.600	1350	$6,750
IV. CONCLUSIONS	.500	1125	$2,250
V. APPENDICES	.750	1687	$13,500
EID BUILD-UP AT WRALC	1.75	3937	$7,875
T.M. PREPARATION	1.20	2700	$13,500

TIME SCALE: 1 2 3 4 5 6 7 8 9 10 11 12 15

0 1 2 3 4 5 6 7 8 9 10

MAR APR MAY JUN JUL



ATTACHMENT II

A-2470

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

1 July 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
Turkish AN/ALR-46 Software
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 10
(June 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 June to 30 June 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

During June, work continued on the drafting of an FMS Final Report and on the construction of a small scale sample EID. Attachment II shows the completion levels of the various sections of the Final Report and indicates that the project is proceding on schedule.

Documentation

The following is a list of Technical Memoranda (TM) prepared through 30 June 1980, that are related to FMS.

Number	Date	Subject
TM-2470-000-11	4 June 1980	Final Report Appendices
TM-2470-000-12	9 June 1980	Preliminary Draft of Section II of FMS Final Report Describing Basic Pre-Testing Construction of an AN/ALR-46 Emitter Identification (EID) Table
TM-2470-000-13	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part I: Introduction
TM-2470-000-14	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part II: Threat Forms
TM-2470-000-15	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part III: PRI Plot Compilation
TM-2470-000-16	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part IV: Compilation of the Index Sheets
TM-2470-000-17	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part V: Ambiguity Resolution
TM-2470-000-18	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part VI: Coding
TM-2470-000-19	9 June 1980	Construction of the Turkish FMS AN/ALR-46 EID, Part VII: Sample EID to Demonstrate Rules

Meetings

An FMS meeting was held at WR/ALC on 10 June 1980. The purpose of this meeting was to present WR/ALC personnel with the following set of TM's describing the basic pre-testing construction of an AN/ALR-46 EID:

TM-2470-000-12
TM-2470-000-13
TM-2470-000-14
TM-2470-000-15
TM-2470-000-16
TM-2470-000-17
TM-2470-000-18
TM-2470-000-19

These Technical Memoranda will form a ground work for Section II of the FMS Final Report. Attendees of the 10 June meeting are listed in Attachment I.

Efforts Expended

A summary of the professional and non-professional support efforts on this project during June 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	50
Cockerham, B. Research Scientist I	168
Creswell, R. E. Research Engineer II	168
Harrington, A. J. Research Engineer I	168
Larkin, D. M. Research Engineer I	96
Lipscomb, M. A. Research Scientist I	99
Miller, T. M. Senior Research Engineer	34
Stroud, L. E. Senior Research Engineer	84
Vogler, F. H. Research Scientist	5
Technical Support Personnel	367

Expenditures

Cumulative expenditures through 31 May 1980 were $244,575. Estimated expenditures during June were $25,400. The project ceiling price is $400,000 leaving an estimated free balance of $130,025 at the end of June.

Schedule

The attached completion/expenditure chart (Attachment II) maps out the project milestones which remained uncompleted as of 1 April 1980. These milestones include preparation of the FMS Final Report which is scheduled for completion by 31 July 1980.

Future Efforts

During July the Final Report will be completed for submission to the sponsor by the scheduled project termination date. Work on the report is on schedule and there are no foreseeable problems at this time which might delay the completion of the report.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

tas

ATTENDEES AT MEETING

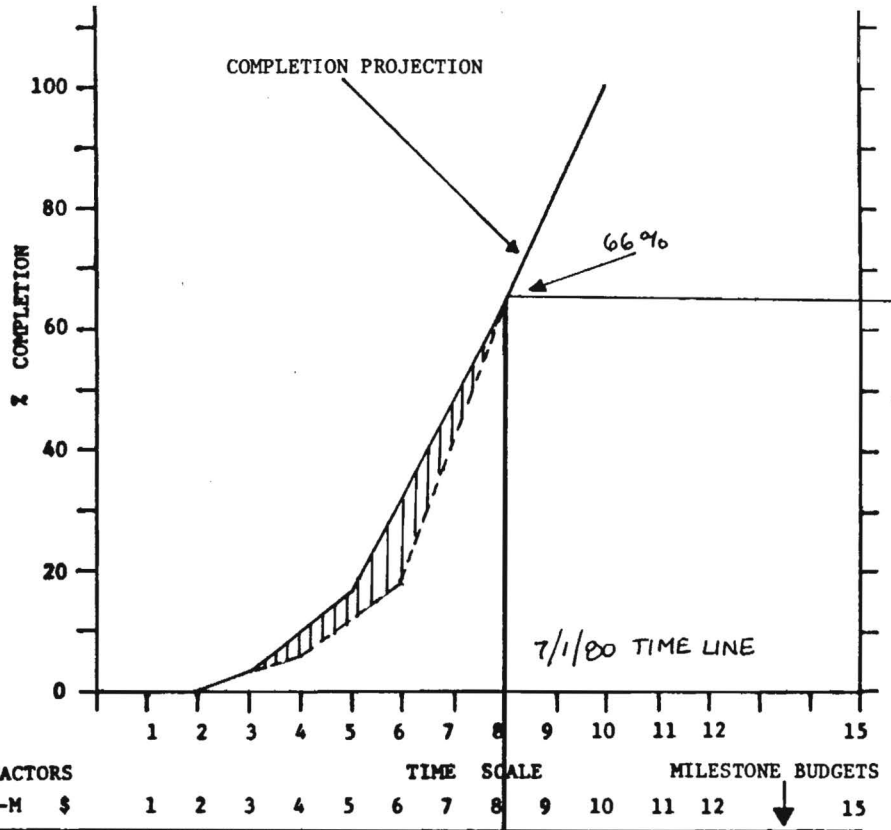
Date	Place	Present
10 June 1980	WR/ALC	Bill Peters, WR/ALC
		Capt. Cousin, WR/ALC
		Tom Miller, EES
		Dean Spencer, EES
		Ron Creswell, EES
		Larry Stroud, EES
		Andy Lipscomb, EES
		Adrienne Harrington, EES

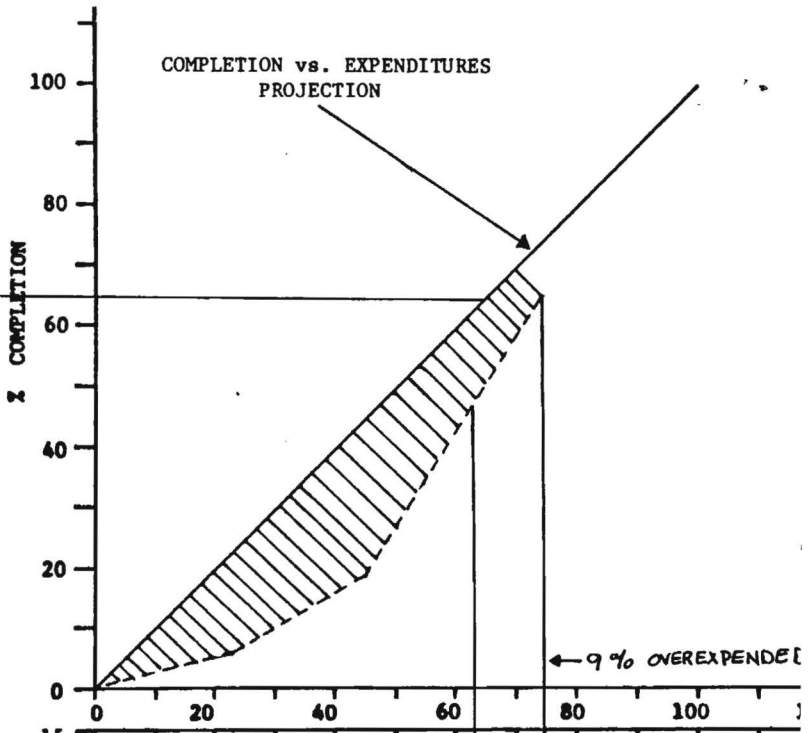
ATTACHMENT I

Date: 1 July 1980
Project Name/Number:
FMS/A-2470
Project Director:
W. D. Spencer
Scheduled Duration
1 Mar. — 31 Jul.
Time Scale Units:
2 Divisions/Month

Projected ————————

Actual — — — — — —

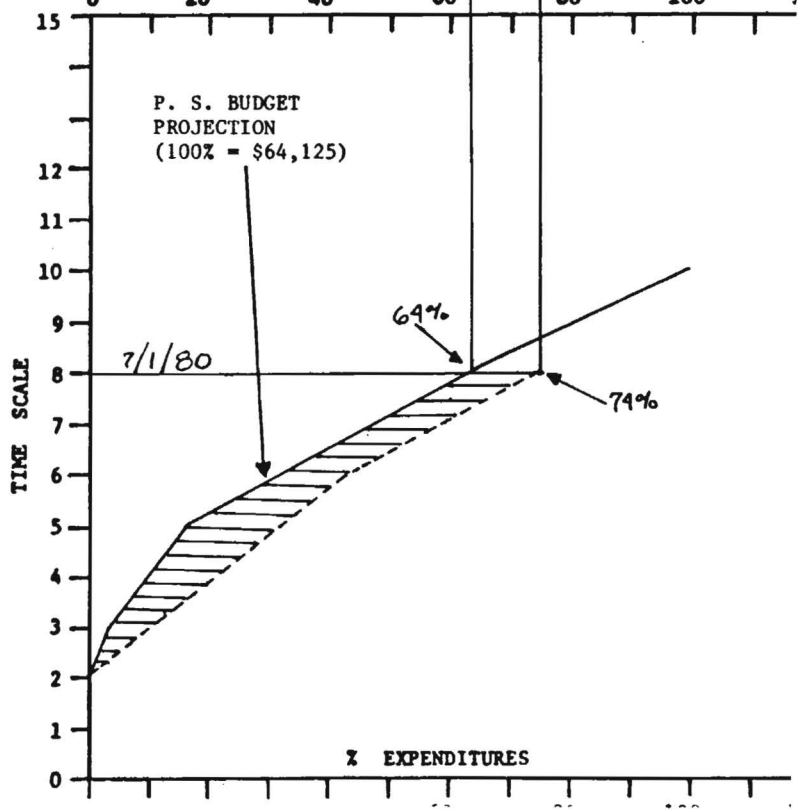




	MILESTONES	FACTORS M-M	FACTORS $	MILESTONE BUDGETS
1	FINAL REPORT PREP.			
2	Intro/General	.667	1500	$6,750
3	Procedures/Rules	1.20	2700	$13,500
4	Testing	.600	1350	$6,750
5	Conclusions	.500	1125	$2,250
6	Appendices	.750	1687	$13,500
7	EID BUILD-UP at WR	1.75	3937	$7,875
8	TM PREPARATION	1.20	2700	13,500
9				
10				

TIME SCALE 1 2 3 4 5 6 7 8 9 10 11 12 15

MAR APR MAY JUN JUL



ATTACHMENT TT

A-2470

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

1 August 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

ATTENTION Mr. Rick Yeager/PMZBB
Contracting Officer

REFERENCE: F09603-78-G-4368 Order No. 0010
Turkish AN/ALR-46 Software
GA Tech Project No. A-2470

SUBJECT: Monthly Status Report No. 11 (Final)
(July 1980)

Gentlemen:

A summary of the progress on the referenced contract for the period 1 July to 30 July 1980 is contained herein.

Objective

The purpose of the effort is to prepare an Emitter Identification Table for the AN/ALR-46 radar warning receiver. Intelligence data is to be reduced and decision rules selected to allow signal identification. Verification of this data will be done manually. The results will be coded and integrated with the Operational Flight Program. Tests will verify correct performance with the new data. Source data for updates to technical manuals will be provided.

Summary of Technical Efforts

During July, the FMS Final Report was completed in draft form in accordance with the 31 July 1980 contract termination date. Attachment II charts the final status of the project indicating a 100% completion of all project milestones.

Documentation

The following is a list of Technical Memoranda (TM) prepared through 31 July 1980, that are related to FMS.

Number	Date	Subject
TM-2470-000-20	30 July 1980	Construction of the Turkish FMS AN/ALR-46 EID Part VIII; Weapon System Analysis (Secret)
TM-2470-000-21	30 July 1980	Calculation of FRAME TIME Limits for ALR-46 EID Construction for FMS
TM-2470-000-22	30 July 1980	Summary of Rules Regarding Computation of K-Short, NSCLI and PRIDE; Limits of
TM-2470-000-23	31 July 1980	Final Report Review Meeting

Meetings

An FMS meeting was held at WR/ALC on 31 July 1980. The purpose of this meeting was to review Sections One through Three and the Appendices of the Final Report draft. Attendees of this meeting are listed in Attachment I.

Efforts Expended

A summary of the professional and non-technical support efforts on this project during July 1980 is shown below.

Professional Personnel	Man-Hours
Spencer, W. D. Senior Research Engineer	55
Cockerham, B. Research Scientist I	151
Creswell, R. E. Research Engineer II	149
Harrington, A. J. Research Engineer I	121
Larkin, D. M. Research Engineer I	18
Lipscomb, M. A. Research Scientist I	39
Mackey, G. F. Senior Research Engineer	37

Miller, T. M. Senior Research Engineer	9
Stroud, L. E. Senior Research Engineer	55
Technical Support Personnel	256

Expenditures

Cumulative expenditures through 30 June 1980 were $268,961. Estimated expenditures during July were $18,200. The project ceiling price is $400,000 leaving an estimated free balance of $112,839 at the end of July.

Schedule

The scheduled completion date of 31 July 1980 was met and the Turkish FMS project is completed. The Final Report will be submitted to WRALC in final form on 31 August 1980. The attached completion/expenditure chart (Attachment II) shows the project's final status.

Future Efforts

Final review, typing, and submission of the FMS Final Report will take place during August. This status letter constitutes the final Monthly Status Report to be written under the Turkish FMS project contract.

Respectfully submitted,

W. D. ~~Spencer~~
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

tas

ATTENDEES AT MEETING

Date	Place	Present
July 1980	WR/ALC	Capt. E. Cousin, WR/ALC
		Dean Spencer, EES
		Ron Creswell, EES
		Larry Stroud, EES
		Andy Lipscomb, EES

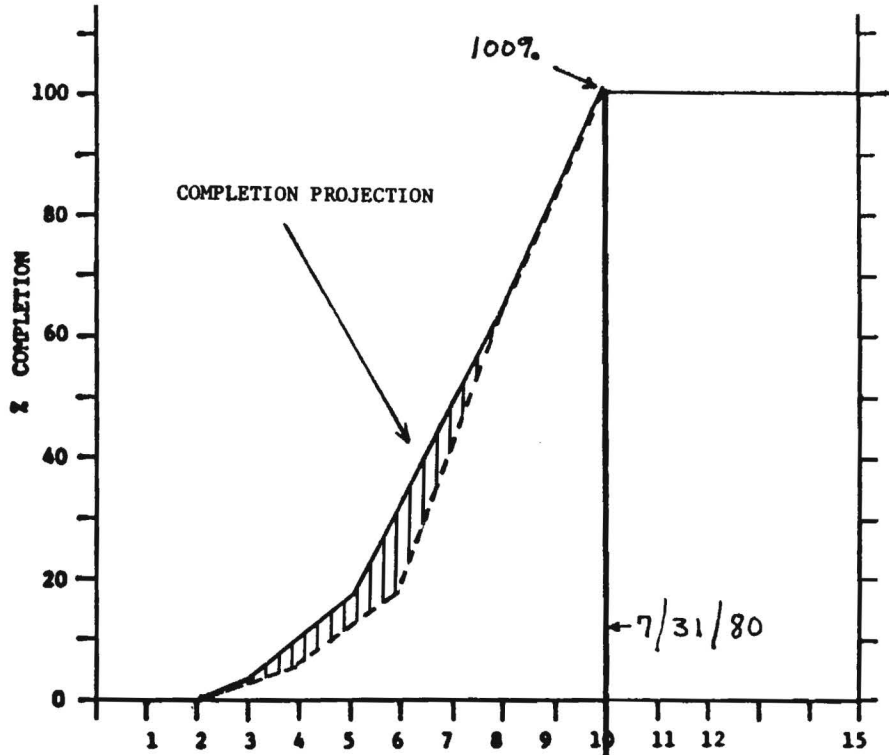
ATTACHMENT I

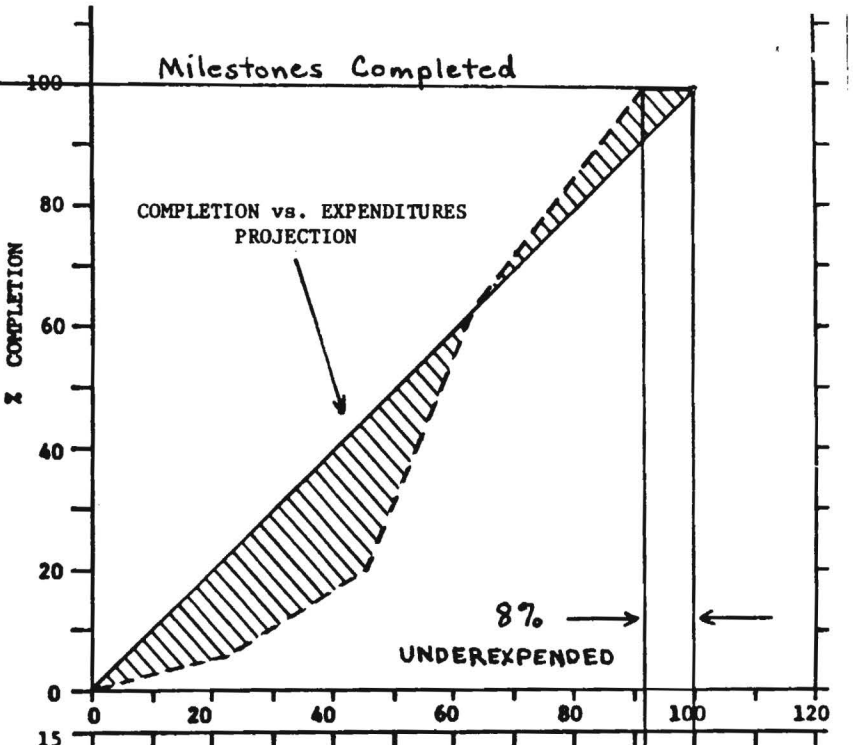
ATTACHMENT II

Date:	1 August 1980
Project Name/Number:	FMS/A-2470
Project Director:	W. D. Spencer
Scheduled Duration	1Sep 79-31 Jul 80
Time Scale Units:	2 Divisions/Month

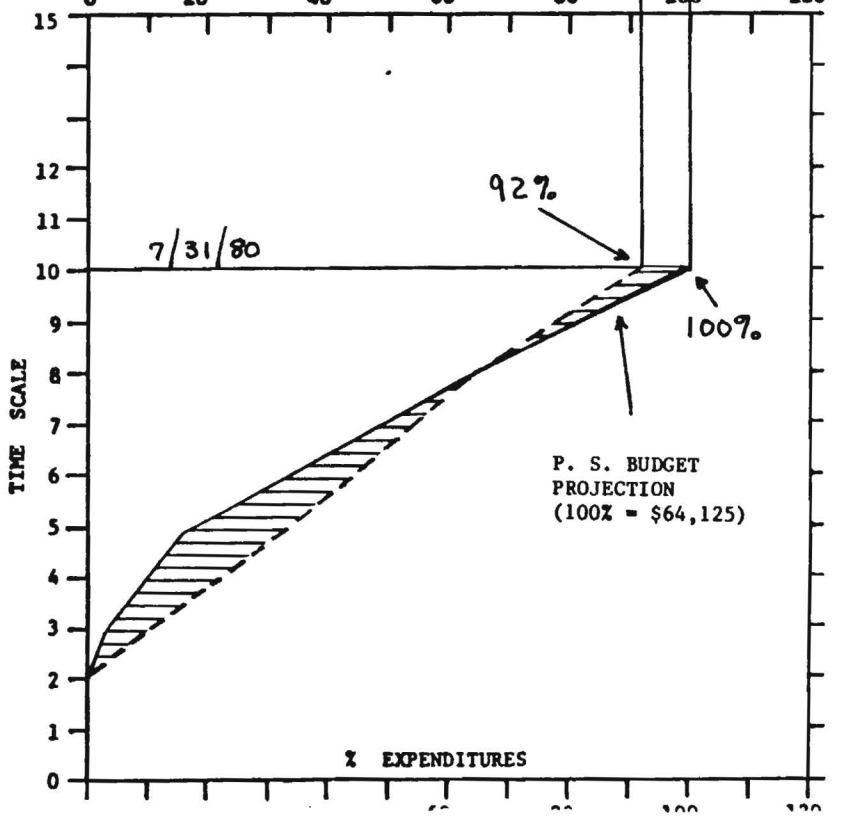
Projected ——————

Actual - - - - - -





MILESTONES	FACTORS M-M	FACTORS $	MILESTONE BUDGETS
1 FINAL REPORT PRE.			
2 Intro/General	.667	1500	$6,750
3 Procedures/Rules	1.202	700	$13,500
4 Testing	.600	1350	$6,750
5 Conclusions	.500	1125	$2,250
6 Appendices	.750	1687	$13,500
7 EID BUILD-UP at WR	1.753	937	$7,875
8 TM PREPARATION	1.202	700	$13,500
9			
10			



A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

22 October 1979

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

Attention: Mr. Rick Yeager

Reference: F09603-78-G-4368 Order No. 0010

Subject: Meeting Minutes Summary No. 1
Preliminary Design Review

Please find enclosed three (3) Technical Memoranda, TM-2470-100-8, TM-2470-040-5, and TM-2470-020-2, which summarize the Preliminary Design Review at Robins Air Force Base, 5 October 1979.

Respectfully submitted,

R. E. Thomas
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

RET/dga

Enclosures:

A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 16 October 1979

TM-A-2470-040-5

TO: FMS File
RET, REC, LES, MAL, ACH

FROM: W. D. Spencer

SUBJECT: FMS Meeting 5 October 1979 at WRALC

ENCLOSURE: Minutes of Meeting

The attached constitutes minutes from the meeting of EES/WRALC concerning the Flow Generation from Analysis and PRI plots on 5 October 1979.

The meeting essentially resulted in a number of decisions regarding determination of parametric values to be recorded/used, and directions to proceed in accordance with these rules to the point of:

(a) filling out all Threat Forms
(b) constructing all PRI plots
(c) constructing flows for Band I plots

A copy of the Kilting File Guide (2 volumes) should be made available at EES if further FMS work is to be undertaken. The majority of questions that will now arise can be resolved by use of the guide.

There is a question of using track modes for a duty cycle of <0.03 and checking with WR-ALC for DC between 0.03 and 0.10. Also attached are copies of the actual scan role conversion table and PRI AGE Transition values.

There is a question to be resolved on the methodology that cannot be expressed in the memo, regarding Band resolution; however, band (i.e. cross-band) resolution relates to associated or synched emitters, not band overlap. Also, emitters are to be separated by stable and jittered PRI in PRI plots.

ALR-46 FMS Meeting

Place: WR-ALC

Present:

John Louth	WR
Dean Spencer	EES
Larry Stroud	EES
Ron Creswell	EES

Subject: Review of Flow Generation Work to date under EID Preparation Project for the Turkish ALR-46 FMS.

1. The threat forms for the BAND I Threats, PRI plots, and rough flows were reviewed and questions concerning problem areas were discussed.

2. The following guidelines were established:

   a. Classify Threat Forms in accordance with the EPG data including downgrading.

   b. Page numbers on Threat Forms will run sequentially regardless of the number required for a particular threat.

   c. Calculate LSS by the equation. If the figure conflicts with the TAWC supplied data, flag for WR-ALC consideration.

   d. AGEOUT - Calculate "percentage of paint-time" for each scan-mode and use highest percentage mode. Indicate which mode has been used.

   e. For naval threats, use the symbol associated with a corresponding land threat.

   f. PRI range for MG (Missile Guidance) will be treated as individual cases. In general, PRI range is related to sub-frame not frame length.

   g. All PRI ranges will be shown on Threat Forms. In general, they will all be plotted except where ambiguities result. In that case, single or low-number intercepts, "probable" intercepts etc. may be deleted but will be flagged on the (Threat Form). Maintenance and mal-function PRIs will normally, be plotted.

   h. If PRIs are known to be harmonically related, end points of associated PRI ranges must be integrally related.

i. Collateral intelligence information may be used to assist in interpreting EPG data; however, Threat Forms will be filled out only with data specifically supported by EPG data. Supplemental notes for WR-ALC only will be provided if this guideline seems to result in inconsistent, incomplete or contradictory results.

j. Scan Type for a constant illumination beam will be designated as "Full"

k. Pulse width criteria

<1.2 μ sec Narrow

>1.7 μ sec Wide

1.2≤ PW ≥ 1.7 μ sec Flag on TF and resolve with WA-ALC.

l. PRI range criterion is to use 2 limits where given.

m. Do not use PRIs which would cause a transition equal to a "squirt box" transition value.

n. Flag all data on TF not carried to the PRI plot (i.e. that relates to PRI values).

o. The following sketches indicate the rules to be used in resolving PRI ranges that are "close" in end values (either inter-or intra threat).

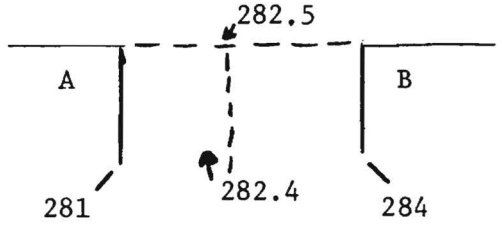
PRI Spread Factor

Two distinct threats

a)

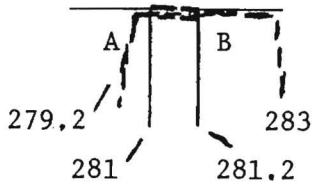
"close up" with 2 μ sec extensions

b) If A/B are less than 4μsec but more than 1μsec apart, split the difference.

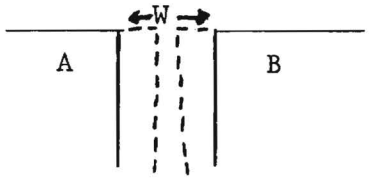


(separate by .1μsec using low side for separation)

c) If A/B are less than 1μsec apart, use the normal 2μsec spread and create an ambiguity.



GAP Closure Criteria
One threat with several PRI ranges.



$W \leq 5\ \mu$ sec - extend each range to close gap so W = 0.

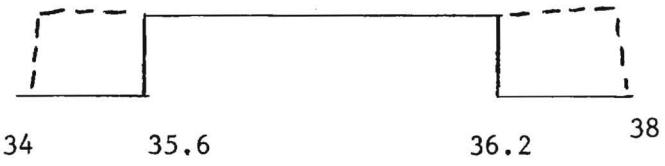
W > 10μsec - use the inter threat spread factor

$5 < W \leq 10\mu$sec - Flag and resolve with WR-ALC

p. Scan Rate Spread Criteria convert the rate in Hertz to an octal count. The spread(S) will always be

$$1.0 \leq S \leq 1.99$$

and will be in integral values.



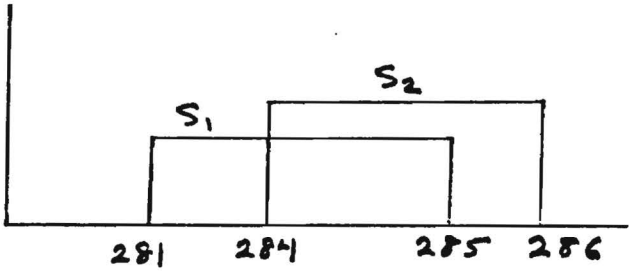
For purposes of resolving ambiguities by scan rate, a minimum window of 4 counts is required.

q. Resolutions of ambiguities will be made in order of the priorities previously given and flows will not exhibit all possible resolutions.

r. Use 100μsec/page for all plots. Construct so they can be fitted together.

s. For scan resolution, scan rates R<9.57Hz cannot be treated. Scan resolution cannot be used on jitter PRIs. Modulation depth may prevent scan resolution (e.g. conscan vs loro).

t. For listing ambiguities, use the .1μsec resolution limit of the ALR-46 as shown in the sketch.



#1 281 - 283.9 (S_1)
#2 284 - 284.9 (S_1, S_2) Ambiguity
#3 285 - 286 (S_2)

3. Correct errors made on TF, by interpreting supplemental letter on threats correctly.

4. It was established that the connections between mode designation letters in different sub-files of the Kilting File are as determined by EES and present no further problem.

5. Tom Batterman edited and added comments to TM-2470-030-1.

6. The next review should take place at the completion of
TFs all filled in
All PRI plots completed
Band 1 flows completed

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 18 October 1979

TM-2470-100-8

TO: FMS File

RET, WDS, REC, LES, FHV, TMM, RPZ,
M. Bennett

FROM: R. E. Thomas

SUBJECT: Minutes - Preliminary Design Review,
A-2470

The PDR for the Turkish FMS effort was held at WRALC on 5 October 1979. There were three major topics:

1. The statement of work
2. Review of initial analysis and methodology
3. Test planning

This memo describes changes to the statement of work and delivery requirements. TM-2470-040-5 describes the analysis methodology as discussed in the review of work to date. TM-2470-020-2 describes the scope of testing and an approach to test planning.

Attendees

Several different meetings were held concerning the above topics. This list includes all participants.

Tom Batterman	WRALC
John Louth	WRALC
Larry Sheets	WRALC
Rick Thomas	GT

Frank Vogler	GT
Dean Spencer	GT
Larry Stroud	GT
Ron Creswell	GT
Pat Rusk	GT
Al Harbuck	GT
Jim Worsham	GT

Contract Revisions

Revisions to the contract were discussed in several areas. These changes are to be prepared at WRALC and should be to OCA by 5 November 1979. In the meantime, work will proceed based on these minutes.

The statement of work is to be modified. Paragraphs 3.1.1, 3.1.1.1, 3.1.1.2, 3.1.1.3, 3.1.3, 3.1.3.1 and 3.1.3.2 are to be omitted. Paragraph 3.1.3.3 will be renumbered 3.1.2.5.

Government supplied data will be changed slightly. In paragraph 6.1, "EID Analyzer and Generator Manual" will not be available. Material requiring TAC approval for release will be available in 45 days. Other material required for test planning and EID specification will be available as needed at WRALC. The government furnished equipment specified in Paragraph 6.2 will not be supplied.

Considerable changes will be made to the deliverable data items. A001, A002, A00C, A006, A008 and A009 will be omitted. Two data items will be added as called for in the statement of work: the EID end item and source data for T.O. updates. This is a tentative list of the data items.

1) Service engineering reports (monthly)
2) Minutes of reviews (5, as needed)

3) System test plan (90 DAC)
4) Computer program documentation in contractor format including
    a) threat data sheets
    b) PRI plots
    c) resolve flow diagrams
5) Computer program identification number request including PROM part numbers (90 DAC)
6) Source data for updates to
    a) acceptance test procedure
    b) I/O exercisor diagnostic
    c) total performance diagnostic
    d) operating instructions
7) EID end item

Georgia Tech will be asked to show that intelligence data used in the FMS project are kept apart from other sources of data. Only the data provided under the contract are to be included in the Turkish signal processor. Several measures suggested are, 1) maintain a clear designation for FMS documents, 2) keep documents in a separate safe, and 3) maintain tracability of all final data. Georgia Tech will state appropriate procedures in a separate letter.

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM

TM-A-2470-020-2

19 October 1979

TO: A-2470-020-2 File

FROM: J. A. Worsham and A. C. Harbuck

SUBJECT: Minutes - Test Planning Meeting
5 October 1979

RET, ACH, JAW, and TPR visited Tom Batterman to discuss the EID verification and system testing. The net result of this meeting was a better understanding by all involved of the procedures and possible problems in verifying the EID table. This memo describes the minutes of this meeting.

The first topic of discussion was the EID verification itself. The testing will be done using the ALR-46 test station at WR-ALC on a second shift, non-interference basis. The possibility of using EWOLS if available was also discussed. The test procedure will consist of two parts. The first part will be checking the EID for incorrect pointers, improperly set bits, and other mechanical errors. This is done with software tools that are hosted on the ALR-46 test stations at WR. The second part will be checking for logic errors and other more subtle errors in the EID. This is done by stimulating the ALR-46 test bed with RF from various simulated threats. By changing the parameters of these threats in various ways, it will be possible to check the various test parameters, resolves, and logical flows of the EID table. In order to do this testing in an efficient manner it will be necessary that the logical flow of the EID be well documented in a form that will be easy to comprehend. One possible solution to this problem is a flow-chart or some other similar document showing the logical flow and resolves in the EID. It will be necessary to submit a final report describing the testing of the EID to WR-ALC. The report must consist of a formal statement of the tests used to verify the EID, a full log showing all tests completed, results, corrective action, etc., and a full set of engineering notes gathered during the test phase.

The next topic was the writing of the ATP for the EID. The ATP will contain a detailed description of the tests necessary to test the EID. The new ATP will be written using the old existing ATP and any applicable TO's as guides for making corrections and modifications where needed. All testing will be done using the test stations and software testing tools at WR-ALC. At present the only available software testing tool is an EID exerciser program. This program checks for incorrect pointers, improperly set bits, and other mechanical errors in the EID. There are other tools under development at this time but it isn't known yet if they will be available in time to use in the testing and verification phase of the contract. The two people at WR-ALC who are experienced in the use of the test stations and software testing tools are Larry Sheets and Jesse Lee. These are the two people we should interface with in the writing of the ATP and in performing the testing and verification phase of the contract.

ACH/dga

A-2470

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

4 January 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

Attention: Mr. Rick Yeager

Reference: F09603-78-G-4368 Order No. 0010

Subject: Meeting Minutes Summary No. 2

Enclosure TM-A-2470-040-8, Minutes of F.M.S. Meeting at WR/ALC on 10 and 11 December 1979, is hereby delivered. Appendix One is omitted having been provided by WR/ALC.

In addition, Secret TM-A-2470-040-9 (U) containing the classified portions of the meeting is being forwarded under separate cover.

There may be a priority conflict in obtaining the necessary review time from Mr. Louth during the month of January, 1980. It is anticipated that at least one day each week in January will be necessary for him to review progress and provide guidance in arriving at approved threat forms, PRI plots, and Resolve Flows. Further progress in

coding and testing is contingent upon completion of these items.

Also to be forwarded with the classified Technical Memo are the items incorporating final changes and considered to represent completed and reviewed forms to date.

Respectfully submitted,

W. Dean Spencer
Project Director

APPROVED:

Thomas M. Miller, Jr., Chief
Defense Systems Division
Systems Engineering Laboratory

WDS/dg
Enc.

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 18 December 1979
TM-A-2470-040-8

TO: FMS File, A. J. Harrington
W. D. Spencer, R. E. Creswell, L. E. Stroud, M. A. Lipscomb
FROM: L. E. Stroud and R. E. Creswell
SUBJECT: Minutes of FMS Meeting at WR/ALC on 10 and 11 December 1979

1.0 INTRODUCTION The following are the unclassified minutes of the FMS Meeting referenced above. In addition, a "SECRET" TM 2470-040-9 containing the classified portions of the subject meeting is in the classified file for Project A-2470.

2.0 MEETING MINUTES The following persons attended the meeting:

John Louth	WR/ALC
*Dean Spencer	EES
Larry Stroud	EES
Ron Creswell	EES
*Capt. Woody Cousins	WR/ALC
*Andy Lipscomb	EES

*Not present on 11 December 1979.

The agenda for the 10 December meeting was as follows: summary comments are added for completeness.

EES STATUS BRIEF - EES briefed our present status as Threat Forms 95% complete, PRI Plots 90% complete, and Resolves 5% attempted with none completed to our satisfaction.

TYPICAL THREAT FORM QUESTIONS - EES asked questions relevant to threat forms and specific weapon systems. The useful information obtained is contained in the above referenced classified TM.

BAND 1 (NORMAL/ 1 / S) PACKET REVIEW - This review consisted of a review of applicable threat forms, PRI Plots, resolve worksheets, and flows.

BAND 3 (2 EXAMPLES) PACKET REVIEW - same as above.

The agenda for the 11 December meeting was as follows:

SPECIFIC QUESTIONS AND DISCUSSION - EES presented specific questions for clarification and to obtain additional information. An introductory ALR-46 system summary was obtained and is attached as Appendix 1.

BAND 1 THREAT FORM REVIEW AND APPROVAL - John Louth reviewed, made changes, asked for further changes based on subsequent EES analysis and approved "marked up" Band 1 Threat Forms.

LES/REC/dg
Attachment

AK170

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

1 February 1980

Warner Robins Air Logistics Center
Robins Air Force Base
Georgia 31098

Attention: Mr. Rick Yeager
Contracting Officer

Reference: F09603-78-G-4368 Order No. 0010

Subject: Minutes of Formal Reviews, Inspections and Audits (A004)

Please find enclosed five (5) Technical Memoranda, TM-A-2470-100-10, TM-A-2470-040-10, TM-A-2470-100-11, TM-A-2470-040-12, and TM-A-2470-050-1, which summarize the Project Review Meetings during the month of January.

Respectfully submitted,

W. D. Spencer
Project Director

APPROVED:

Tom M. Miller, Chief
Defense Systems Division
Systems Engineering Laboratory

WDS/dg

Encs.

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA GEORGIA 30332

10 January 1980

TECHNICAL MEMORANDUM
TM-2470-100-10

TO: A-2470 File

FROM: T. P. Rusk

SUBJECT: Meeting on Data Requirements for FMS Contract

A meeting was held at WRALC on 9 January 1980, to discuss requirements for the generation or modification of data items for the FMS Turkish effort. In attendance at this meeting were:

Mr. Al Akin	WRALC
Mr. George Mouzon	WRALC
Mr. Al Harbuck	GT
Mr. Pat Rusk	GT

Mr. Akin had expressed concern to the effect that Georgia Tech was ignoring requirements contained within the SOW and that Georgia Tech was not capable of performing certain tasks contained within that same SOW.

Since it was not clear exactly the extent of Mr. Akin's knowledge of the background of this program, I briefly summarized the chain of events which led up to a contract award in September 1979, after many months of delay on the part of the Air Force. It was further pointed out that these delays, without parallel extensions in the required contract end date, were the primary reason for deleting tasks from the SOW.

With regard to data items, it was pointed out that Georgia Tech did have the capability to provide source data, modify Tech Orders, generate ATP's, PROM tapes, etc, depending upon the desires of the Air Force, but it was unlikely that this work could be finished by 31 March 1980. Mr. Akin was then informed that, if Air Force would make its wishes known, Georgia Tech would respond with a schedule that would probably not create any difficulty with regard to real schedule needs.

Mr. Akin acknowledged that there was no requirement to complete the data items by 31 March, and that, in fact, this would be impossible. He explained considerations of contracting with ARINC for the editing and printing of Tech Orders based on source data received from Georgia Tech. After discussion of alternatives, this appeared to be the most efficient route to follow. Mr. Akin asked that the source data be available by 15 April. I told him that we would try.

I asked Mr. Akin to include in the amendment of the SOW a contract extension to 31 July 1980, to enable us to support both the ARINC data effort and the Air Force in-house production effort from a consulting standpoint. Mr. Akin agreed that this was necessary.

The question regarding CPINs was raised. I informed Mr. Akin that CPINs was a mystery to us, whereby he explained that there were application forms that, when filled out, would result in assignment of CPINs. I told him that, when we were furnished with the application forms, they would be filled out and returned. He responded that his group would fill them out for us.

In some cases, this meeting might have appeared to be very touchy. In actual fact, it was a candid exchange that led to a clearer understanding as to Georgia Tech's intentions to support the mission of the EW Management Division at WRALC. It may take many more meetings of this nature to establish a firm working relationship here.

je

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ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 30 January 1980

TM-A-2470-040-10

TO: A-2470-040 File

FROM: W. D. Spencer

SUBJECT: Review Meeting at WR/ALC on 7-8 January 1980

A threat form/flow review meeting took place on 7-8 January 1980 with the following personnel attending:

J. Louth, WR/ALC
W. D. Spencer, EES
L. E. Stroud, EES
M. A. Lipscomb, EES
R. E. Creswell, EES
T. P. Rusk, EES

A large number of changes were made; most of which were parameter values. It was pointed out by John Louth that AI radars should also be in the Sea Mode while SAN's should be in the Land Mode.

Discussion of resolve procedures also took place with an explanation of how branching and looping occurs.

It was suggested that some sheets could be combined if the resolves were common and the symbol ID the same.

The effects of antenna feed, rotation, etc. on scan rate was discussed and it was pointed out that the primary scan rate of one threat had been omitted from the threat form.

Rules for determining the end points of PRI/Ambiguity ranges were laid out and have been reduced to a 2x2 matrix. Where two PRI ranges would normally have a common edge, a previous rule applies and an arbitrary assignment to the edge has been made to allow the use of the decision matrix.

The Band 1 Threat forms/flows and Band 0/2 Threat forms were approved contingent upon the review changes being incorporated.

The procedure to be used with Band 3 forms is to send them to WR/ALC where they will be modified and returned for final changes.

WDS/dg

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 30 January 1980

TM-A-2470-100-11

TO: A-2470-100 File

FROM: W. D. Spencer

SUBJECT: Review Meeting at WR/ALC on 8 January 1980

On 8 January 1980 a meeting involving

J. Black, WR/ALC
T. Batterman, WR/ALC
T. Dyal, WR/ALC
T. Miller, EES
W. D. Spencer, EES
T. P. Rusk, EES

took place during which several items of concern over scheduling, deliverables, and future work were discussed. Tom Batterman expressed his concern over EES' resources and whether or not sufficient personnel could be assigned to complete both threat forms/flows and coding in time to meet the contract end date. A tentative decision was reached to assign some WR/ALC personnel to forming a skeleton EID and for WR to be prepared to provide assistance if required.

The revisions to the Statement of Work were discussed and it was determined that the revisions had not yet been sent to the procurement group.

In addition to the changes delineated in EES TM-2470-100-8, 18 October 1979, Preliminary Design Review, deliverables A00B, A007 will be deleted and A00A and A005 combined into one. Also, it was determined that the contract end date should be set back to 31 July 1980 to allow time for completing documentation. (T.O. source data will be required at an earlier date yet to be determined.)

A discussion regarding EES' participation in future FMS efforts resulted in a clarification of EES and WR/ALC outlooks. Tom Miller explained that EES is not a job shop or production facility and that when FMS work ceased to have connotation of research and became essentially the mechanics of production, it would be an inappropriate activity for EES. On the other hand, EES was committed to establishing a small group of who could provide consulting assistance and streamline the methods now used in EID production. EES would probably find a significant level of participation in 3-6 FMS efforts acceptable.

Tom Batterman stated that he had understood EES was to develop a cadre of experienced personnel who would be "on call" as needed to perform future FMS work. No final satisfactory resolution was arrived at during this meeting.

A final agreement was that EES would review available manpower and provide WR/ALC an assessment within a few days of their capability and confidence in completing the contract as specified and modified.

WDS/dg

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 31 January 1980

A-2470-040-12

TO: A-2470-040 File

FROM: W. D. Spencer

SUBJECT: Review Meeting at WR/ALC on 30 January 1980

On 30 January 1980 a review meeting was held at WR/ALC attended by

John Louth, WR/ALC
Larry Stroud, EES
M. A. Lipscomb, EES
W. Dean Spencer, EES

to review Band 3 Threat Forms. Several parameter changes were made as well as guidance provided on how to make value assignments. Several administrative remarks concerning notes on the forms were made by John Louth to insure that the final forms represent an objective engineering effort justified by analysis based on the source documents provided.

The Band 3 forms will require one more review in early February. In addition, Band 0/2/3 PRI Plots through Flows will require a review (Band 0/2 items are now at WR/ALC - Band 3 items will follow the next Band 3 Threat Form review).

It was clear from the review that some decision rules needed revision, some can never be applied without subjective assessments and some had not been addressed carefully enough in the Band 3 Threat Form development. It is anticipated that the next review, however, will result in very few additional changes.

WDS/dg

Georgia Institute of Technology
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ATLANTA, GEORGIA 30332

TECHNICAL MEMORANDUM 31 January 1980

TM-A-2470-050-1

TO: A-2470-050 File

FROM: M. A. Lipscomb

SUBJECT: Trip Report - 22 January 1980 thru 24 January 1980 and 29 January 1980 thru 31 January 1980

A series of meetings was held at WR/ALC on 22-24 January and 29-31 January 1980 to review progress on Project A-2470, to review procedures for the coding tasks, and to begin the coding efforts. The following persons were involved at various times.

Representing Georgia Tech:

T. M. Miller	(1/22 - 1/24 meetings)
W. D. Spencer	(1/29 meeting)
F. H. Vogler	
M. A. Lipscomb	
L. E. Stroud	(1/29 meeting)
M. D. Rucker	(1/29 - 1/30 meetings)

Representing WR/ALC:

J. Louth

E. Cousins

The principal accomplishments each day were as follows.

22 January 1980

Mr. Louth briefed Mr. Miller, Mr. Vogler, and Mr. Lipscomb on the procedures employed by WR/ALC engineers in EID coding. The briefing included directions for organizing data into the final form used in the EID; a description of the operating characteristics of the computer on which the coding is performed; and descriptions of various software aids available for use in the coding tasks.

In the evening the coding task was begun for Band 1. Coding includes among other tasks, extraction of data from the threat forms, PRI plots and flowcharts, and entering the data into P-set, T-set, and Resolution tables. Under the direction of Mr. Louth, Mr. Lipscomb began preparation of the T-set data, and Mr. Vogler began preparation of the Stagger and Band Resolution Tables, while Mr. Miller familiarized himself with the computer and entered the P-set data.

Although the Band 1 flowcharts had previously been approved, several changes in the resolution procedure were introduced by Mr. Louth during the coding. These changes were noted on the flowcharts and the flowcharts were returned to Georgia Tech for revision.

Mr. Louth and Capt. Cousins prepared a skeleton EID for use in the coding. The preparation of a skeleton EID involves the removal of all threat-specific information from an existing EID while leaving the various pointers, constants, and other structural determinants intact. Mr. Miller observed the procedure.

23 January 1980

Mr. Miller continued the data entry task. Mr. Lipscomb continued the preparation of T-set data. Mr. Vogler prepared the Scan Resolution Table.

Coding consists of two phases: preparation of individual tables and integration of these tables with the skeleton EID to produce the final product. By the end of the day the first of these tasks was essentially complete for Band 1, lacking only the Guidance Resolution tables, which are not extensive, and entry of a portion of the prepared data into the computer.

24 January 1980

Mr. Miller continued the data entry, and instructed Mr. Vogler in the use of the computer. Mr. Lipscomb revised the Band 0 and Band 2 flowcharts, which had not been previously reviewed by WR/ALC, in accord with the most recent specification for these items.

29 January 1980

Mr. Vogler instructed Mr. Rucker in the use of the computer editing facilities. Mr. Louth demonstrated the procedure for assembling programs on the computer.

31 January 1980

Mr. Louth reviewed the Band 3 threat forms and PRI plots and introduced minor modifications in a meeting with Mr. Stroud, Mr. Lipscomb, and Mr. Spencer. The documents were approved as modified.

Mr. Lipscomb inspected the skeleton EID and prepared notes on the procedure for producing the skeleton EID and integrating the new threat data tables into it.

Mr. Rucker completed the data entry for all completed tables.

31 January 1980

Mr. Louth reviewed the Band 0 and Band 2 flowcharts and introduced minor modification in a meeting with Mr. Lipscomb. The documents were approved as modified.

MAL/dg

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, Georgia 30332

ACCEPTANCE TEST PROCEDURE
for the
TURKISH AN/ALR-46

10 March 1980

Prepared for

Warner Robins Air Logistics Center
Robins Air Force Base
Warner Robins, Georgia 31099

Contract No. F09603-78-G-4368

TABLE OF CONTENTS

ABSTRACT

This document defines the planned inspection and acceptance testing of the Emitter Identification Program (EID) for the Turkish AN/ALR-46 radar warning receiver at Warner Robins Air Force Base. Major sections deal with 1) Test Preparation Procedures, 2) Band/ Resolve Verification Testing, 3) Final Acceptance Testing Procedures, and 4) Documentation Requirements.

1.0 INTRODUCTION

1.1 Purpose The AN/ALR-46 is an aircraft-installed radar warning receiver which monitors and identifies incoming threat signals. The test procedures provided herein establish the methods for final verification of the Turkish Emitter Identification (EID) data base which has been prepared for the AN/ALR-46 by the Engineering Experiment Station (EES) at Georgia Tech under contract to Warner Robins Air Logistics Center (WR/ALC). This test plan includes the responsibilities for testing, a description of the test procedures, and establishes the support requirements at the testing facility used during the test program. It will be the purpose of these tests to verify the ability of the EID program to produce the correct threat symbols and type numbers associated with the sample signals fed into the receiver.

1.2 Scope The acceptance test procedures for the Turkish AN/ALR-46 will consist of Test Station Preparation, EID Band/Resolve Verification Testing, and Final Acceptance Testing. These three functional classes of testing procedures are briefly described below.

1.2.1 Test Station Preparation Before testing of the EID program can begin, a series of preliminary procedures designed to establish proper test station operation must be completed. These procedures include the following:

A. Equipment Inspection
B. Test Station Power Up and Initial Subsystem Check
C. System Memory Load
D. E.I.D. Program Load and Verification
E. Verification of Test Station Operation

1.2.2 EID Band/Resolve Verification Testing Upon completion of the preliminary procedures, testing will begin on the EID program as coded and documented on paper tape. These tests will be conducted on one band at a time with all resolves within one band receiving complete verification before proceeding to the next band.

1.2.3 Final Acceptance Testing After successful verification of the Turkish EID, the data will be loaded into the PROM's which will in turn be installed on an A-2 memory card of the ALR-46 prototype processor. The installed processor will be tested against a series of diagnostic tapes in sequence to insure proper operation of the ALR-46 prototype under all possible conditions.

1.3 Flow Chart Figure 1 shows a generalized flow chart of the Acceptance Test Plan for the Turkish AN/ALR-46.

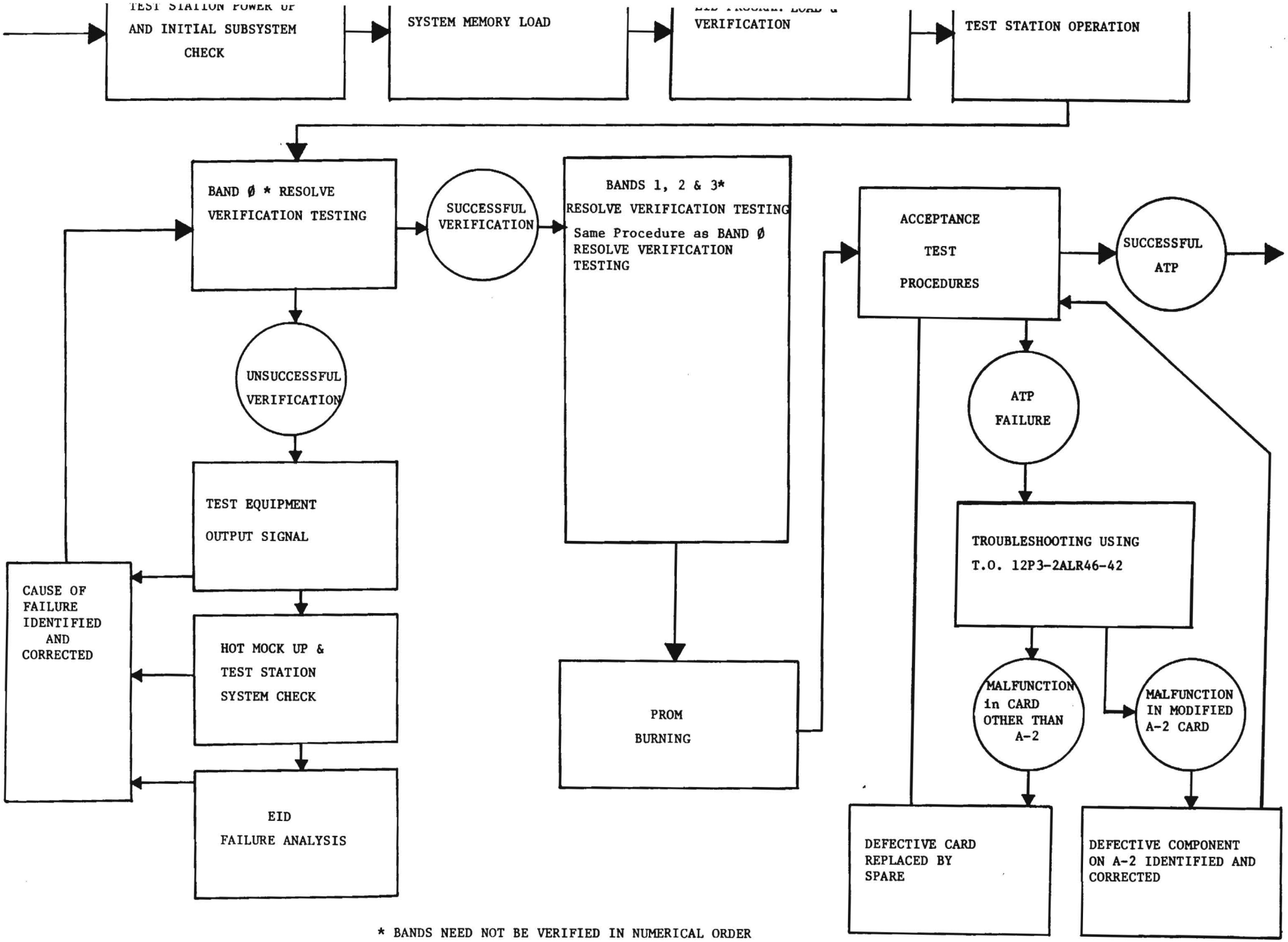
2.0 SUPPORT REQUIREMENTS AND SCHEDULES

2.1 Support Requirements

2.1.1 Instrumentation and Software The support equipment required to perform the EID verification and acceptance test procedures is the normal equipment used by the AN/ALR-46 test group at Robins Air Force Base. This includes but is not limited to the equipment and software listed below.

2.1.1.1 Signal Generators

A. Antekna Model 3200, 2-4 GHz
B. Antekna Model 3200, 4-8 GHz, 2 each
C. Antekna Model 3200, 8-12 GHz
D. Antekna Model 3300, 1-2 GHz



* BANDS NEED NOT BE VERIFIED IN NUMERICAL ORDER

FIGURE 1

E. Antekna Model 3300, 8-12.4 GHz, 2 each

F. Antekna Model 3300, 12.4-18 GHz

2.1.1.1.1 Guidance Signal Generators

The Electronic Warfare Open Loop Simulator (EWOLS) will serve as an external source for guidance signal simulation as required.

2.1.1.2 Scan/Pulse Generators

A. Antekna Model 1210, 2 each

B. Antekna Model 1220

C. Antekna Model 1294, 2 each

D. Antekna Model 1400, 2 each

2.1.1.3 Frequency/Time Counters

A. H.P. Model 5328A, 2 each

B. Anadex Model CF-500R

C. H.P. Model 3310A

D. H.P. Model 3312A

E. Data Pulse Model 101

2.1.1.4 Bench Test Set

A. AN/ALR-46 Hot Mock-up

B. CM-442A Test Bed

C. Rolm 1601 panel with ALR-46 processor(s) and Flex File 10

D. Vistar 3 Display Terminal

E. Paper Tape Reader

2.1.1.5 Ancillary Equipment

A. Oscilloscope, HP 1720A, 2 each
B. Power Meter
C. Power Splitters
D. Coaxial Attenuators
E. RF and coaxial cables

2.1.1.6 Software

A. OFP and EID
B. Super bug
C. EID exerciser
D. Memory Verifier
E. RAM Memory Exerciser Diagnostic Tape (T.O. 12P3-2ALR46-48-ICT-6-2)
F. Display Refresh Exerciser Diagnostic Tape (T.O. 12P3-2ALR46-48-ICT-3-1)
G. I/O Exerciser Diagnostic Tape (T.O. 12P3-2ALR46-48-ICT-4-2)
H. Total Performance Diagnostic Tape (T.O. 12P3-2ALR46-48-ICT-5-2)

2.1.1.7 Technical Orders

A. T.O. 12P3-2ALR46-42
B. T.O. 12P3-2ALR46-48-1

2.1.2 Equipment Maintenance and Calibration Requirements The maintenance and calibration of the support equipment will be the responsibility of the government. The contractor will be responsible for operator maintenance of the support equipment and for reporting any equipment malfunctions to the project monitor.

2.1.3 Facility and Personnel Requirements The test verification and ATP will be performed on a non-interference basis using the AN/ALR-46 test station. The non-interference condition will require that some or all of the work be performed after the normal day shift hours (1600 to 2400 probably being the test hours). Since the ALR-46 test station is in a classified area, the government will be required to furnish a

monitor for the contractor employees. The monitor must be familiar with the tasks being performed to the extent that the determination can be made regarding contractor access to both equipment and information. The monitor will be responsible for the security of the area and the building if the contractor personnel are the last to conclude work for the day. The contractor personnel will be responsible for proper power down of the ALR-46 test station and test equipment used during the test.

2.2 Time Requirements The estimated time required to perform the EID verifications, the PROM burns, and the modified Acceptance Test Procedures with the prototype processor is three weeks. The estimate is based on the approximation of two weeks for EID verification, and one week for PROM burn and Final Acceptance Test.

2.3 Contractor Personnel Requirements A minimum of two contractor personnel will comprise the test team for verification of the EID program and the Final Acceptance Test. One person must be familiar with the test equipment listed in Section 1.3.1. The second person should be familiar with the structure of the EID data.

3.0 TEST PREPARATION PROCEDURES

3.1 Scope This section describes preliminary procedures to be carried out by contractor personnel prior to initiating the EID verification sequence. Any equipment failures or deficiencies shall be documented and reported to the project monitor as quickly as possible.

3.2 Equipment Inspection The inspection procedure will consist of accounting for and visually examining the support equipment listed in Section 2.1.1.

3.3 Test Station Power Up The AN/ALR-46 Test Station will be turned on and each subsystem checked to verify normal operating indications are present.

3.4 System Memory Load The system software required for normal operation will be loaded into the memory. After a successful load indication, the "Superbug" program will be loaded.

3.5 EID Program Load The Turkish EID program will be loaded and a run command initiated to verify that the correct checksum is generated.

3.6 Verification of Test Station Operation The test station operation will be verified by initiating a system test on the test station control panel. The testing and verification of the Turkish EID will not proceed beyond this point until a successful system test indication is received.

4.0 BAND/RESOLVE VERIFICATION TEST

4.1 Scope The Emitter Identification data will be verified in the basic layout of the resolve tree. The ability of the EID program to identify and display the correct threat symbols and type numbers associated with various sample signals will be demonstrated.

4.2 Procedure The procedure will be to divide the program into different bands and verify all resolves within one band before proceeding to the next band. The bands do not have to be verified in numerical sequence. Within each band, the step-by-step tasks will be dependent on the resolve sequence of the ALR-46 and the threat data. The resolve tree will be followed until all resolves within the capability of the system have been completed. The various resolves are identified and briefly described below.

4.2.1 PRI Resolve The simplest resolve is based on the PRI of the threat radar within a particular band. Since the resolve is primarily based on a comparison of two conditions, the simple PRI resolve is the baseline condition until the comparison results in a resolve. The resolve now becomes the baseline condition for additional comparison if the data is available.

4.2.2 Band Resolve The band resolve is the comparison of a PRI resolve in the band under test to a PRI in another band. This resolve relates to an associated emitter in another band and not to a condition that arises from band overlap.

4.2.3 Stagger Resolve The stagger level resolve is obtained from a single threat using more than one pulse repetition interval. This resolve is not related to incidental stagger resulting from system instability.

4.2.4 Jitter Resolve The jitter resolve is obtained from the variation of the PRI on a pulse-to-pulse basis. It is not related to system instability.

4.2.5 Guidance Resolve The guidance resolve is based on comparison of data related to the signals associated with guided missiles.

4.3 Failure Analysis A failure is defined as a system, subsystem, or component that exhibits abnormal indications, fails to function or fails to successfully complete a test.

4.3.1 Test Station Failures Any component of the test station that exhibits a failure during the test will be cause to cease the test upon identification of the failure. The contractor test team will attempt to identify the cause of the failure. If the cause can be identified and resources are available, the test team will repair the test station. If the cause cannot be identified or the resources are not available to repair, the test will be terminated until the AN/ALR-46 group restores the test station to normal operation. The test team will not troubleshoot or repair beyond the module level.

4.3.2 Support Equipment Failures Support equipment failures will be cause to cease the test until the cause of the failure is identified and corrected. The redundancy in capability of test equipment should minimize the impact of these failures. The substitution of test equipment for a failed item of test equipment is acceptable if the test team documents the substitution.

4.3.3 Turkish EID Failures A failure of the EID is defined as the test station indicator not displaying either the correct symbol or type number, or the indicator displaying no symbol or number within ten (10) seconds after application of an RF source. The identification

of an EID failure will cause the test sequence to stop at the point of earliest identification. The test team will record the failure data and initiate the identification procedures outlined below.

The first step in the identification of the cause of the failure will be the verification of the proper signal output from the test equipment. The substitution of similar test equipment will be used where possible to eliminate failed test equipment. If substitution is not practical, support test equipment (scopes, counters, power meters, etc.) will be used to verify the correct output is being obtained. If the test equipment output has been verified as correct, a system test from the test station will be initiated. The system test should identify a cause of failure within the hot mock-up or test station.

If the procedures above do not identify the cause of failure, it will be assumed the failure is a result of an EID error. The test sequence will go back to the initial resolve within the resolve tree being tested and each step repeated. If the failure is identified at the same point of the test, the failure will be documented as an EID failure. No additional testing will be conducted until the cause of the EID failure has been identified. To assist in the error analysis the test team can vary test equipment parameters in small increments and only one parameter can be varied at one time. Accurate documentation during this phase will be essential to assist in correcting the EID program.

4.3.4 Retest Procedures The test sequence will not be resumed at the point of failure identification after the cause of failure has been identified and corrected. As a minimum, the test sequence will restart at the beginning of the resolve tree in which the failure was identified. This restart point and each subsequent step will be repeated for any test equipment, hot mock-up or test station failure, and the test data will be identified as retest data. The original data will be maintained also. Any failure charged to the EID program that results in a change to the EID program code will require specific retest procedures be identified. The documentation of these procedures will be an integral part of the engineering notes.

4.4 DOCUMENTATION AND REPORTS

4.1.1 Documentation Engineering notes will be maintained during the verification of the EID program. These notes will document test conditions, status of hot mock-up, availability of required test equipment, and pertinent failure data.

All failures will be accurately documented to accurately reflect the conditions existing at the time of failure. The time of initial identification, point of test sequence, cause of failure, action taken to identify the cause, corrective action, time of test restart, and the time of test cessation will be the minimum data required. A synopsis of the notes will be part of the documentation furnished to the government.

4.4.2 Reports In addition to the engineering notes, a report on the verification of the Turkish EID program will be prepared following a

format agreed upon by the project monitor. The report will be of sufficient detail to verify that the EID program accurately resolves the threat information.

5.0 FINAL ACCEPTANCE TEST

5.1 Scope The Acceptance Test Procedures (ATP) contained herein provide a method for demonstrating the capability of the AN/ALR-46 loaded with the Turkish EID data base in the form of the processed PROM's.

5.2 Procedure After successful verification of the Turkish EID, the data will be loaded into the PROM's. The processed PROM's will be installed on an A-2 Memory Card and installed on the ALR-46 Test Station. The Acceptance Test will be performed in the sequence of the diagnostic tapes as listed in Section 5.3. The detailed instructions for each diagnostic tape is contained in T.O. 12P3-2ALR46-48-1. Sections III through VI of the technical order apply to programs listed in Sections 5.3.2 through 5.3.4 respectively.

5.3 Acceptance Test Support Requirements The ATP will be performed using the procedures in T.O. 12P3-2ALR46-2, T.O. 12P3-2ALR46-48-1, and the following diagnostic tapes:

5.3.1 RAM Memory Exerciser Diagnostic Tape, T.O. 12P3-2ALR46-48-ICT-6-2 The Memory Exerciser completely checks the processor random access memory. The RAM check consists of automatically writing test data into each RAM location and reading out that data to verify that it was properly stored.

5.3.2 Display Refresh Exerciser Diagnostic Tape, T.O. 12P3-2ALR46-48-ICT-3-1 The Display Refresh program verifies that the Display Refresh Input Buffer, DRIB, circuits display all possible symbols in pre-determined positions on the CRT display. This program is arranged in groups of test instructions separated by a programmed halt. At the halt, the address switches on the test set computer control unit are set to a new address. The program is then manually restarted. After restart, control signals are routed to the processor. Test set indicators and test points are monitored to verify circuit status.

5.3.3 I/O Exerciser Diagnostic Tape, T.O. 12Pc-2ALR46-48-ICT-4-2 The I/O program verifies that the processor I/O circuits, video processing circuits, and audio circuits respond properly to external threat and control signals. The program is arranged as groups of test instructions separated by programmed halts. At each halt, test set and/or adapter controls must be manually operated to route simulated threat or control signals to the processor. Test set indicators and/or test points must be monitored to verify circuit status.

5.3.4 Total Performance Diagnostic Tape, T.O. 12P3-2ALR46-48-ICT-5-2 The total performance program verifies that the processor performs as an integrated, complete unit by displaying the symbol file at predetermined locations on the test set CRT. This program is arranged as groups of test instructions separated by manual stops. At each stop, a new address is entered into the computer and the program re-started. Test set and/or adapter controls must be manually operated to route simulated threat or control signals to the processor. The test set CRT and audio speaker must be monitored to verify circuit status.

5.4 Verification A failure that occurs during the performance of the ATP indicates a failure within the ALR-46 processor but not necessarily within the modified A-2 card. To verify the malfunction and identify the cause, T.O. 12P3-2ALR46-42 will be used for troubleshooting information. If the failure can be identified as a malfunction on a card other than the A-2 card, the defective card will be replaced using spares normally available to the test station. If the failure can be identified as a malfunction on the modified A-2 card, an un-modified card will be installed in the processor. The program will be restarted. If the program is completed without a failure the modified A-2 card will be re-installed in the processor. Troubleshooting information in T.O. 12P3-2ALR46-42 will be used to assist in the identification of the defective component on the A-2 card. After a failure has been corrected, the program being used at the time of the failure will be restarted at its initial step. Successful completion of all four diagnostic tapes in the proper sequence will verify proper operation of the ALR-46 processor with a modified A-2 card installed.

5.5 Documentation and Reports Engineering notes will be maintained during performance of the Final Acceptance Test. The notes will document all pertinent test conditions as described in Section 4.4.1. All failures and retest procedures during the course of the Acceptance Test will be included in the report described in Section 4.4.2. A synopsis of the engineering notes will be part of the documentation furnished to the government.